Covenant Deferral Request
Oak Ridge National Laboratory
Facilities Revitalization Project
Joint Institute for Biological Sciences

August 2005

U. S. Department of Energy
Oak Ridge, Tennessee

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Acronyms and Abbreviations

BERA	Baseline Ecological Risk Assessment
BLSD	Below Land Surface Datum
BVG	Bethel Valley Groundwater
CDR	Covenant Deferral Request
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DCGs	Derived Concentration Guides
DOE	Department of Energy
EA	Environmental Assessment
EPA	Environmental Protection Agency
EP&WS	Environmental Protection and Waste Services
FFA	Federal Facility Agreement
FONSI	Finding of No Significant Impact
FRP	Facilities Revitalization Program or Project
GIST	Geographic Information Science and Technology
HHRA	Human Health Risk Assessment
JIBS	Joint Institute for Biological Sciences
JICS	Joint Institute for Computational Sciences
LLLW	Liquid Low-level Waste
M&O	Management and Operating
MCLs	Maximum Contaminant Levels
NCP	National Contingency Plan
NPL	National Priorities List
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCBs	Polychlorinated Biphenyls
PRP	Potentially Responsible Party
RAR	Remedial Action Report
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
SWSA	Solid Waste Storage Area
T&E	Threatened and Endangered
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
USACE	U. S. Army Corps of Engineers
USTs	Underground Storage Tanks
VI	Vapor Intrusion
VOC	Volatile Organic Compound

Oak Ridge National Laboratory
Facilities Revitalization Project
Covenant Deferral Request for the
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1.0 Introduction

The United States Department of Energy (DOE) is proposing to transfer, by deed, portions of real property (hereinafter referred to as "the Property") located on the West Campus at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, and is submitting this Covenant Deferral Request (CDR) pursuant to § 120(h)(3)(C) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and applicable U.S. Environmental Protection Agency (EPA) guidance. The Oak Ridge Reservation (ORR), which includes ORNL, was placed on the National Priorities List (NPL) on November 21, 1989, and investigations and environmental cleanup activities are continuing in accordance with CERCLA, the National Contingency Plan (NCP), and the Federal Facility Agreement (FFA). The FFA[1], a tri-party agreement entered into by DOE, EPA-Region IV, and the Tennessee Department of Environment and Conservation (TDEC) in 1992, establishes the schedules and milestones for environmental remediation of the ORR.

The proposed land transfer described in this CDR is a critical component of the Facilities Revitalization Project (FRP) at ORNL. The objective of the FRP is to replace aging infrastructure through the renovation or replacement of current facilities, where appropriate, in order to enhance ORNL's research capabilities and safety performance while improving operating efficiency. The environmental impacts of implementation of the FRP were evaluated in "The Final Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project" and "Finding of No Significant Impact".[2] The Environmental Assessment (EA) considered the full FRP with the construction of up to 24 new facilities covering up to 50 acres. The EA evaluated the transfer of DOE property to the private sector and the State of Tennessee to support new facilities development. A CDR was prepared in May 2001, to support the transfer of several parcels of property for development. Three private sector buildings were constructed and subsequently leased to DOE's contractor, UT-Battelle. The Joint Institute for Computational Sciences (JICS) was built by the State of Tennessee and is operated by DOE for the University of Tennessee.

This CDR includes approximately 1 acre of land that is proposed for transfer from DOE to the State of Tennessee for construction of the Joint Institute for Biological Sciences (JIBS). JIBS will contain offices and light laboratories. The property will not be used for residential, recreational, or child-care purposes. Figure 1 shows the location of the parcel proposed for transfer.

This proposed land transfer is the third in a series of transfers requested in support of the FRP. CDRs will be submitted for additional, proposed future land transfers, as necessary. DOE will maintain the option for possible repurchase of the land at some time in the future, expected to be

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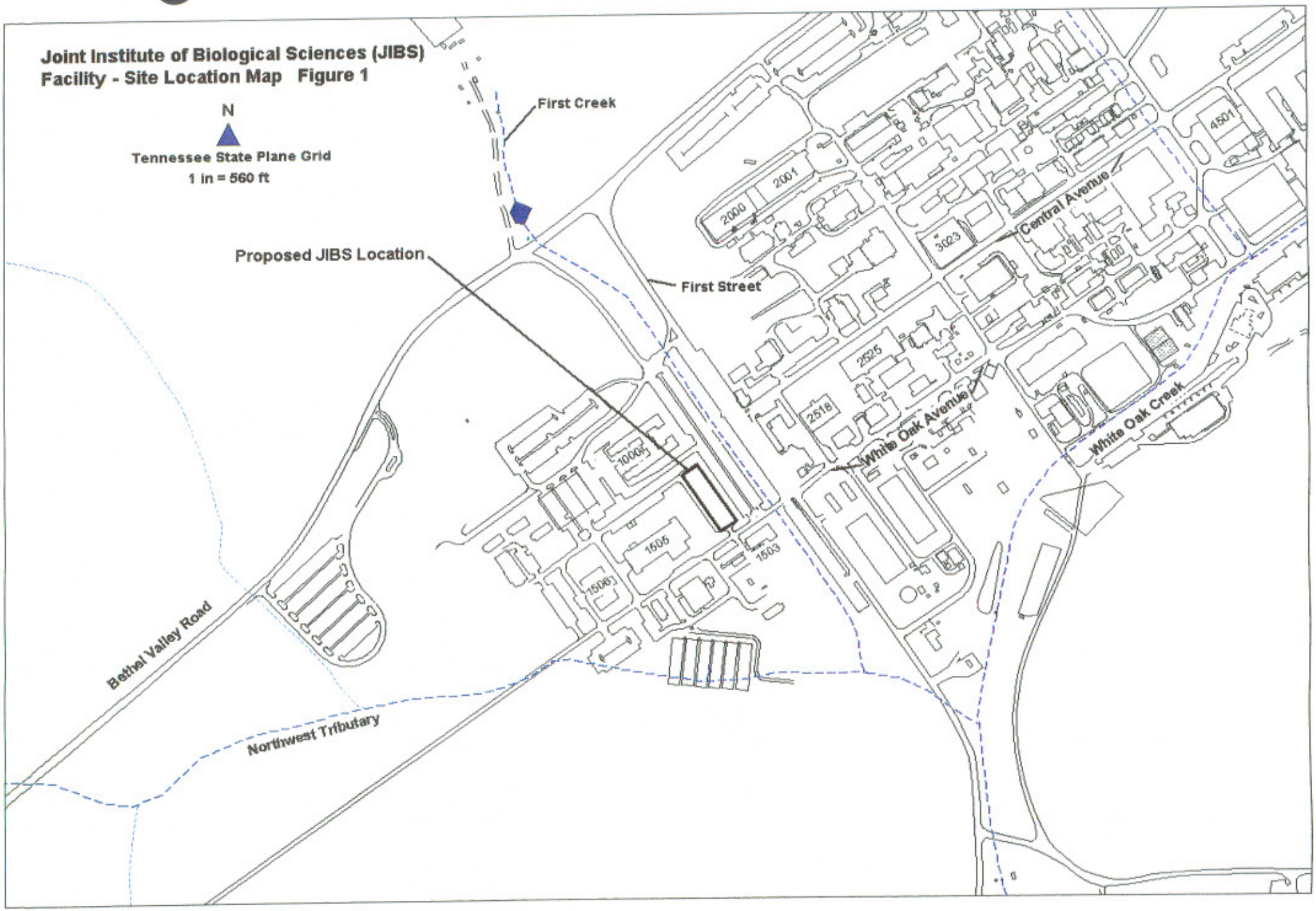
[1] DOE. *Federal Facility Agreement for the Oak Ridge Reservation*, U.S. Environmental Protection Agency, Region IV, Atlanta, GA, U.S. Department of Energy, Oak Ridge Operations, Oak Ridge, TN, and Tennessee Department of Environment and Conservation, Nashville, TN, DOE/OR-1014, January 1, 1992.

[2] DOE. *Finding of No Significant Impact (FONSI) and Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project*, DOE/EA-1362, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN, June 2001.


Joint Institute of Biological Sciences (JIBS)
Facility - Site Location Map Figure 1
N
Tennessee State Plane Grid
1 in = 560 ft
First Creek
Proposed JIBS Location
First Street
Central Avenue
White Oak Avenue
White Oak Creek
Bethel Valley Road
Northwest Tributary
2000
2001
3023
4501
2525
2518
1000
1505
1503
1506

20 to 25 years from now. DOE will continue to be responsible for any legacy contamination discovered after the date of transfer. The deed transferring the Property contains numerous restrictions and prohibitions on the use of the Property. These restrictions are designed to ensure the protection of public health and safety, the environment, and workers. The deed will provide language to the effect that the title of the Property shall, at the option of the Government, revert to and vest in the Government if the Grantee breaches certain use restrictions or prohibitions designed to protect the public health and safety and the environment, as set forth in the deed.

CERCLA requires that when the federal government transfers property the deed must contain two covenants warranting that 1) all remedial actions necessary to protect human health and the environment from hazardous substances remaining on the property have been taken prior to the date of the property transfer (CERCLA § 120(h)(3)(A)(ii)(I) and 2) any additional remedial action found to be necessary after the date of the transfer of the Property shall be conducted by the United States (CERCLA § 120(h)(3)(A)(ii)(II). The deed will contain this last covenant. However, in certain circumstances, EPA, with the concurrence of the Governor of the State in which the facility is located, may defer the covenant set forth in CERCLA §120(h)(3)(A)(ii)(I) warranting all remedial actions necessary to protect human health and the environment have been taken. In order for EPA to defer the covenant requirement in CERCLA §120(h)(3)(A)(ii)(I), EPA must determine under CERCLA §120(h)(3)(C) that the property is suitable for transfer based on the following findings:

1. The property is suitable for transfer for the expected use and such use is consistent with protection of human health and the environment.

2. The deed proposed to govern the transfer between the United States and the transferee of the property contains the Response Action Assurances described in CERCLA §120(h)(3)(C)(ii) with regard to a release of a hazardous substance for which the federal agency is potentially responsible:

    a. Provide any necessary restrictions on the use of the property to ensure the protection of human health and the environment;
    b. Provide that there will be restrictions on use necessary to ensure that required remedial investigations, response actions, and oversight activities will not be disrupted;
    c. Provide that all necessary response actions will be taken and identify the schedules for investigation and completion of all necessary response actions as approved by the appropriate regulatory agency; and
    d. Provide that the Federal agency responsible for the property subject to transfer will submit a budget request to the Director of the Office of Management and Budget that adequately addresses schedules for investigation and completion of all necessary response actions, subject to congressional authorizations and appropriation [42U.S.C.A. §9620(h)(3)(C)(ii)].

3. The federal agency requesting deferral has provided notice, by publication in a newspaper of general circulation in the vicinity of the property, of the proposed transfer and of the opportunity for the public to submit, within a period of not less than 30 days after the date of notice, written comments on the suitability of the property transfer; and

4. The deferral and the transfer of property will not substantially delay any necessary response action at the property.

These findings are intended to ensure that there is a sound basis for the proposed transfer and use not posing an unacceptable risk to human health or the environment. As stated in CERCLA §120(h)(3)(C)(iv), all obligations required of a federal agency remain the same, regardless of whether the property is transferred subject to a covenant deferral.

Within this CDR, DOE presents information and data to support the required findings. DOE describes how the property will be used and why that use is protective of human health and the environment. DOE provides the deed, which contains covenants and restrictions that are necessary for protection of human health and the environment, including, but not limited to, restrictions and prohibitions on the use of the property, provisions for access and remediation without delay, as well as commitments to response actions/schedules/budget requests as required.

DOE submits that this CDR meets the conditions set forth above and hereby requests that the Regional Administrator for EPA Region IV determine, with the concurrence of the Governor of the State of Tennessee, that the Property is suitable for transfer and that the CERCLA §120(h)(3)(A)(ii)(I) covenant may be deferred. Once the deferral request is granted, DOE will proceed to convey the Property while DOE continues to complete all necessary remediation at the ORNL site in accordance with CERCLA, the NCP, and the FFA. The Property does not have active remedial actions identified in the Record of Decision (ROD) for Interim Actions in Bethel Valley.[3] However, Appendix J of the FFA includes a 2012 milestone for the Bethel Valley Groundwater RI/FS and a 2013 milestone for the Bethel Valley Groundwater ROD. Any remedial actions required on the Property by that or any other ROD will be implemented. In accordance with CERCLA §120(h)(3)(B), this CDR pertains solely to the transfer of this Property or any portion thereof to a non-Potentially Responsible Party (non-PRP).

2.0 Property Description

The Property proposed for transfer consists of approximately 1 acre on the West Campus of ORNL in Central Bethel Valley within the Oak Ridge city limits in Roane County, Tennessee. ORNL is owned by the U. S. Government and is operated by UT-Battelle, LLC, for DOE. ORNL was one of three principal DOE facilities constructed in Oak Ridge, Tennessee, during World War II as part of the Manhattan Project. These three facilities comprise what is now known as the ORR. ORNL's original mission was to produce and separate the first gram quantities of plutonium to support the national effort to develop the atomic bomb. ORNL developed and demonstrated the technologies and processes that were later deployed at an operational scale at other locations. Following completion of the Manhattan Project, ORNL became a national center for nuclear reactor technology development. Numerous research reactor designs and applications and radiochemical production and separations processes were developed and implemented at ORNL. Today, ORNL is a multiprogram laboratory whose mission is to conduct applied research and engineering development in support of DOE programs in nuclear fission and fusion, environmental and life sciences, energy conservation, fossil fuels, and other technologies.

On November 21, 1989, the ORR was placed on the NPL by EPA due to environmental releases associated with past waste management and other on-site operations. The area proposed for transfer under this CDR was not directly utilized for any of these activities. As a result of this listing, DOE, EPA, and TDEC signed an FFA for environmental restoration of the ORR, which includes areas of ORNL. The FFA became effective January 1, 1992, and establishes enforceable schedules, and deadlines for the performance and completion of environmental investigation and

[3] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee,* DOE/OR/01-1862&D4, May 2002.

cleanup activities on the ORR, including areas on the ORNL site. A ROD for Interim Actions in Bethel Valley was signed by DOE, EPA, and TDEC in May 2002.[4] The ROD for Interim Actions in Bethel Valley addresses surface and subsurface soils. Section 2.12 in the ROD for Interim Actions in Bethel Valley describes the actions associated with the selected remedy for West Bethel Valley. The Property lies in the unrestricted industrial area (as defined by the ROD for Interim Actions in Bethel Valley; see Section 5.0 for more information on expected property use). The ROD for Interim Actions in Bethel Valley specifies the following land use controls for unrestricted industrial areas: (1) control excavations or penetrations below 3 m (10 ft) and (2) prevent uses of the land more intrusive than industrial use above 3 m (10 ft). Appendix A.1 of the ROD for Interim Actions in Bethel Valley identifies no further action for soil and land use controls as the selected remedy for this Property.

Recent environmental sampling, radiological surveys, and PID measurements conducted at the Property have confirmed that there is no hazardous substance contamination present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. The elevator piston necessary for the proposed JIBS facility will be the only part of the facility that will require penetration into soil and/or bedrock below a depth of 3 m (10 ft) and, thus, require an exception to the designated land use controls. The elevator piston will require a hole approximately 12 inches in diameter to a depth of approximately 37 ft BLSD, and will be cased and sealed at installation. For more details on the recent environmental sampling, see Section 3.6.

The JIBS will contain offices and light laboratories. The Property will not be used for residential, recreational, or child care purposes. For more details on the restrictions, see Section 7.0, Response/Corrective Actions and Operation and Maintenance Requirements. EPA Region IV has worked with TDEC to provide regulatory oversight of the investigation and remediation of the ORR.

The Property for the proposed facility is located in the West Campus area, south of Building 1000 and east of Building 1505. The proposed location is a previously disturbed area. The area was cleared and graded in the late 1940s during site preparation for construction of Building 1000. The site was unused until paved in approximately 1963. The site has been used for a parking lot from approximately 1963 through the present. The site is bordered with various grasses, and small plants and trees. There are both overhead and underground utilities (water, steam, and process wastewater) running through and proximal to the proposed property transfer parcel.

An abandoned septic tank that once served Building 1000, an office building, is located along the northern edge of the property, north of an existing parking area on the east side of Building 1505 as shown in Figure 2. The abandoned septic tank was filled with sand prior to 1993, according to available engineering drawings, and portions of the tank have been removed or otherwise modified to allow construction of utilities in the area in the 1993 timeframe. In order to complete utility tie-ins and construct spread footers for JIBS, the abandoned septic tank will be sampled and evaluated to determine whether it meets the requirements for classification and notification as a solid waste management unit (SWMU), excavated, and properly disposed. Based on review of historical information pertaining to the tank, including the fact that it only served an office building, no hazardous or radioactive contamination is anticipated to be identified as a result of sampling. Removal of the tank is not expected to require excavation below a depth of 3 m (10 ft).

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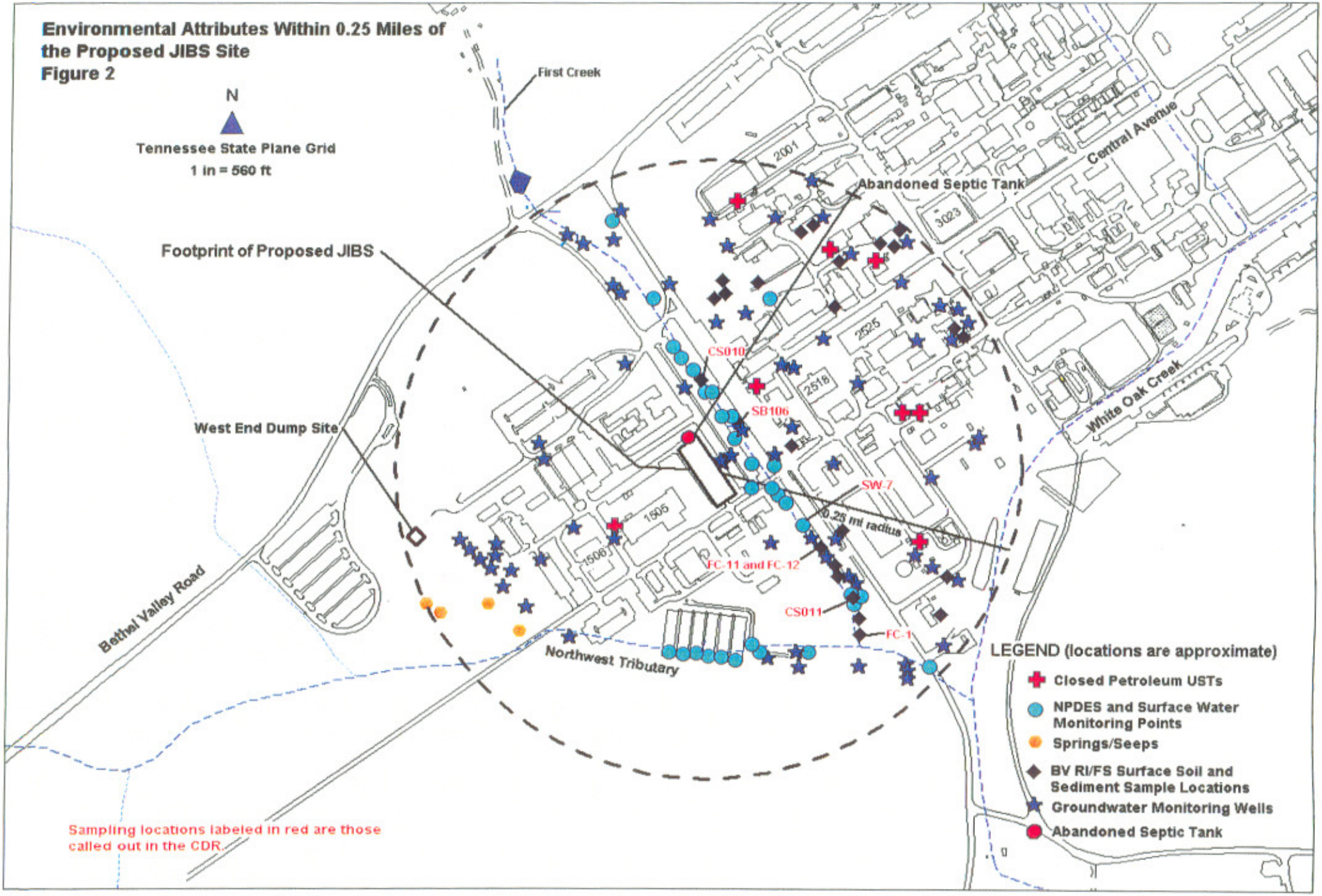
[4] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.


Environmental Attributes Within 0.25 Miles of the Proposed JIBS Site
Figure 2
N
Tennessee State Plane Grid
1 in = 560 ft
First Creek
Footprint of Proposed JIBS
West End Dump Site
Bethel Valley Road
Northwest Tributary
Abandoned Septic Tank
Central Avenue
White Oak Creek
2001
3023
2525
2516
1505
1506
CS010
SB106
SW-7
0.25 mi radius
FC-11 and FC-12
CS011
FC-1
Sampling locations labeled in red are those called out in the CDR.
LEGEND (locations are approximate)
Closed Petroleum USTs
NPDES and Surface Water Monitoring Points
Springs/Seeps
BV RI/FS Surface Soil and Sediment Sample Locations
Groundwater Monitoring Wells
Abandoned Septic Tank

The Property proposed for transfer has been under the ownership of DOE or its predecessor agencies since 1942. Prior to the federal government acquiring the land, the property was used for farming. A description of the Property and a survey are provided in Appendix A, "Boundary, Survey, and Site Plan."

3.0 Environmental Baseline

An assessment of the environmental condition of the Property was performed to support the proposed property transfer. The assessment supplements the "The Final Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project" and "Finding of No Significant Impact".[5] The *Checklist of Environmental Requirements for Real Property Transfers* provided in the *Cross-Cut Guidance on Environmental Regulations for DOE Real Property Transfers*[6] was used to guide the assessment. In support of the CDR, environmental samples (soil and rock samples, and a groundwater sample from a temporary piezometer) were collected to verify that transfer of the Property and the excavation needed to construct the JIBS facility would be protective of human health and the environment. Sampling was performed in accordance with the sampling and analysis plans (SAPs) and ORNL internal procedures, which are based on DOE and EPA sampling methods (see Appendix E for the SAPs). EPA Methods 8260B and 6010B were used for volatile organic compound (VOC) and metal analyses, respectively. Soil and groundwater samples were analyzed for mercury using EPA Methods 7471A and 7470A, respectively. EPA Methods 900.0 and 901.1 were used for gross alpha/gross beta and gamma spectroscopic analyses, respectively. This sampling is described further in Section 3.6.

In accordance with CERCLA Section 120(h), interviews were conducted and deeds, government records, title documents, aerial photographs, and sampling data were reviewed for information on prior uses of the Property and any evidence of hazardous substances or contamination. In addition, visual and physical inspections of the Property and adjacent properties were performed to obtain information on possible contamination. Records of adjacent properties were also reviewed for this purpose. No evidence of hazardous substance use, storage, or disposal at the Property was identified during the document reviews, interviews, review of sampling data, and inspections. The following sections summarize the results of this assessment.

3.1 Visual and Physical Inspection of the Property

A visual and physical inspection of the West Campus was performed on July 26, 2004. The Property consists primarily of a flat asphalt-paved parking area bordered by various grasses, and other plants and trees. Small areas of oily residue are visible in the parking lot and likely resulted from leaking car engines. There are both overhead and underground utilities (water, steam, and process wastewater) running through and proximal to the proposed property transfer parcel. The parcel is roughly bordered by Building 1505 on the west, Building 1000 on the north, the Building 1000 east parking lot on the east, and White Oak Avenue on the south (see Figure 1). No visual or physical evidence of hazardous substance use, storage, or disposal at the Property was identified.

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5 DOE. *Finding of No Significant Impact (FONSI) and Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project*, DOE/EA-1362, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN, June 2001.

6 U.S. Department of Energy, *Cross-Cut Guidance on Environmental Regulations for DOE Real Property Transfers*, DOE/EH-413/9712 (Oct. 97), Appendix C, October 1997.

3.2 Visual and Physical Inspection of Adjacent Properties

A visual and physical inspection of properties immediately adjacent to the proposed property transfer parcel was performed on July 26, 2004. For the purposes of this assessment, property adjacent to the proposed property transfer parcel was defined as Buildings and/or land located *immediately* adjacent to the real property which could have an adverse impact on the real property if hazardous substances were released into the environment.

Two groundwater monitoring wells lie between the proposed site and First Creek, approximately 200 feet to the east of the Property. First Creek contains radiologically contaminated sediments and surface water, which are discussed further in Section 6.0. First Street, a major route for remediation traffic to Melton Valley, is located immediately to the east of First Creek, approximately 220 ft east of the Property.

The ROD for Interim Actions in Bethel Valley[7] identifies several disposal areas (i.e., Solid Waste Storage Area [SWSA] 3, the Contractor's Landfill, the Closed Scrap Metal Area, and the West End Dump Site located in the West Bethel Valley Area, which encompasses the proposed property transfer parcel. With the exception of the West End Dump Site, located in a wooded area west of the 1000 Building, the other disposal areas are located greater than 0.5 mi. west of the proposed site. The inactive West End Dump Site is a 10 ft by 8 ft site located just under 0.25 mi. west of the proposed site (see Figure 2) and consists of several mounds of debris and asbestos-containing material. The site is marked as an asbestos hazard area and will be investigated for potential radiological contamination in the future as part of the ROD for Interim Actions in Bethel Valley.[8] Based on the distances of these disposal areas from the Property and the fact that the shallow groundwater flow direction in West Bethel Valley in the vicinity of the Property is from the northwest to the southeast toward the Northwest Tributary, as shown on Figure 3, these disposal areas in West Bethel Valley do not pose a risk to human health or the environment at the Property.

Buildings 1503, 1505, and 1000 are the nearest buildings to the proposed site (see Figure 1). The buildings are located approximately 80 ft to the southeast, 90 ft to the west, and 110 ft to the northwest of the proposed site. Small amounts of laboratory chemicals are used in Building 1505. Other than the small amount of laboratory chemicals used in Building 1505 and small areas of oily residue in the parking lots of these buildings, no visual or physical evidence of use, storage, or disposal of hazardous substances at or on these immediately adjacent properties was identified.

3.3 Review of Aerial Photographs

Aerial photographs of the proposed property transfer parcel between the 1930s and 1998 were reviewed to identify land use of the Property during that period. With the exception of the 1930s aerial photograph, the photographs were obtained from the ORNL Geographic Information Science and Technology (GIST) Group. The 1930s aerial photograph by the Tennessee Valley Authority (TVA) is on file in the DOE Photographic Archives. A summary of the aerial photographs reviewed is provided in Table 1. Copies of aerial photographs showing the proposed property transfer parcel are provided in Appendix B.

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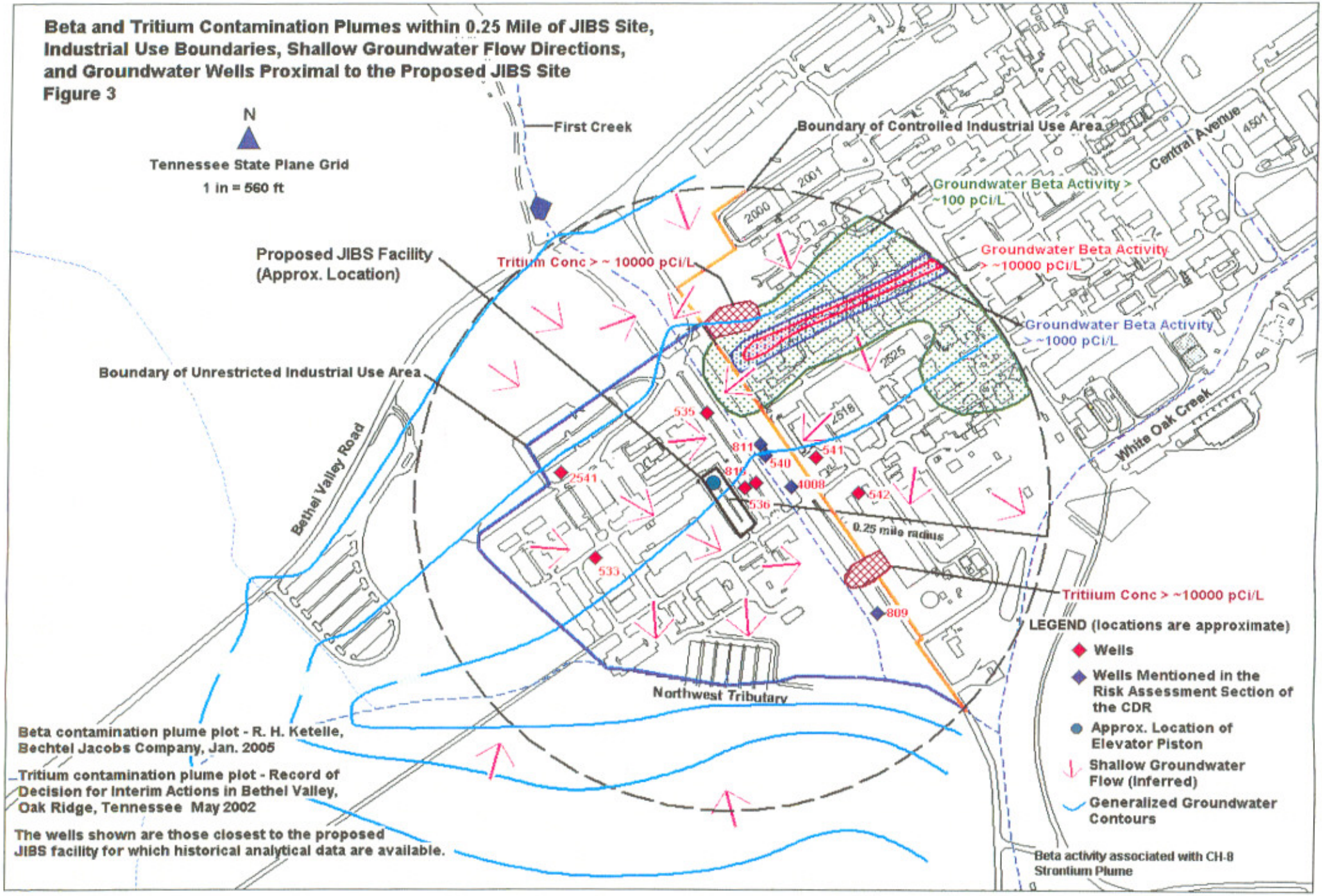
[7] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

[8] Ibid.

Beta and Tritium Contamination Plumes within 0.25 Mile of JIBS Site, Industrial Use Boundaries, Shallow Groundwater Flow Directions, and Groundwater Wells Proximal to the Proposed JIBS Site
Figure 3



Beta contamination plume plot - R. H. Ketelle, Bechtel Jacobs Company, Jan. 2005

Tritium contamination plume plot - Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee May 2002

The wells shown are those closest to the proposed JIBS facility for which historical analytical data are available.

Table 1. Aerial Photograph Summary

GIST Notebook	Year	Collection Date	Collection Time	Scale	Acquisition Agency	Frame Roll
--	1930s[a]	--	--	--	TVA	
ORR Overview 1942 Flightlines 4-6	1942	--	--	--	USACE	820-5-18
ORNL WAG 11 White Wing Scrap Yard	1952	4-30-52	1120	1:43200	TVA	130-2C-21
X-10 Vol. III	1969	3-16-69	1244	1:24000	TVA	64498
X-10 Vol. III	1974	4-19-74	--	1:32600	TVA	WB-3-100,401
X-10 Vol. II	1981	2-25-81	1235	1:12000	TVA	2018-228
X-10 Vol. II	1984	3-7-84	1253	1:24000	TVA	2141-134
X-10 Vol. I	1987	3-26-87	1442 and 1500	1:12000 & 1:24000	TVA	2333-004 & 2334-010
--	1998	March 1998	--	--	Tuck Engineering	--

-- not available
[a] Exact date unknown

The aerial photographs taken in 1942 were part of the original survey of the property purchased for the Manhattan Project. The aerial photographs from the 1930s and 1942 show use of the proposed property transfer parcel for agricultural purposes. No evidence of storage, release, or disposal of hazardous substances is noted from review of the 1930s and 1942 aerial photographs.

Low-altitude aerial and ground-level photographs taken from 1943 through the 1990s[9] were also reviewed. Most of the early photographs were focused on the area of ORNL surrounding the Graphite Reactor and Building 3019, east of the proposed property transfer parcel, and did not show the proposed property. The property appears to have been a grassy area in the early to mid-1940s (see Figure 4) and was disturbed in the late 1940s during construction of Building 1000 (see Figure 5). The area remained open and unused until approximately 1963, when it was paved for a parking area as shown in Figure 6. Building 1505, to the west of the property, was constructed in approximately 1978. Photographs from the late 1960s through the 1990s show little change in the Property (see Appendix B). No evidence of storage, release, or disposal of hazardous substances was observed from the review of the historical low-altitude aerial and ground-level photographs.

Aerial radiometric survey data were reviewed in addition to the aerial photographs. As of the 1997 survey, the Property was not within any area of detected gamma radiation. The nearest gamma radiation detected is approximately 150 ft southeast of the Property along First Creek.[10] Aerial radiometric data[11] is shown in Figure 7.

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[9] The low-altitude aerial and ground-level photographs from 1943 through the mid-1960s are from the DOE Photographic Archives in possession of the DOE Photographer and from the collection of S. H. Stow, Director, American Museum of Science and Energy.

[10] Lockheed Martin Energy Research Corporation. *Qualitative Change Analysis of Aerial Radiological Data of the Oak Ridge Reservation, Oak Ridge, Tennessee*, BJC/OR-106, Bechtel Jacobs Company LLC. September 1998.

[11] EG&G Aerial Radiometric Survey Results, 1992 (as displayed on various ORNL SDI MapInfo Layers).

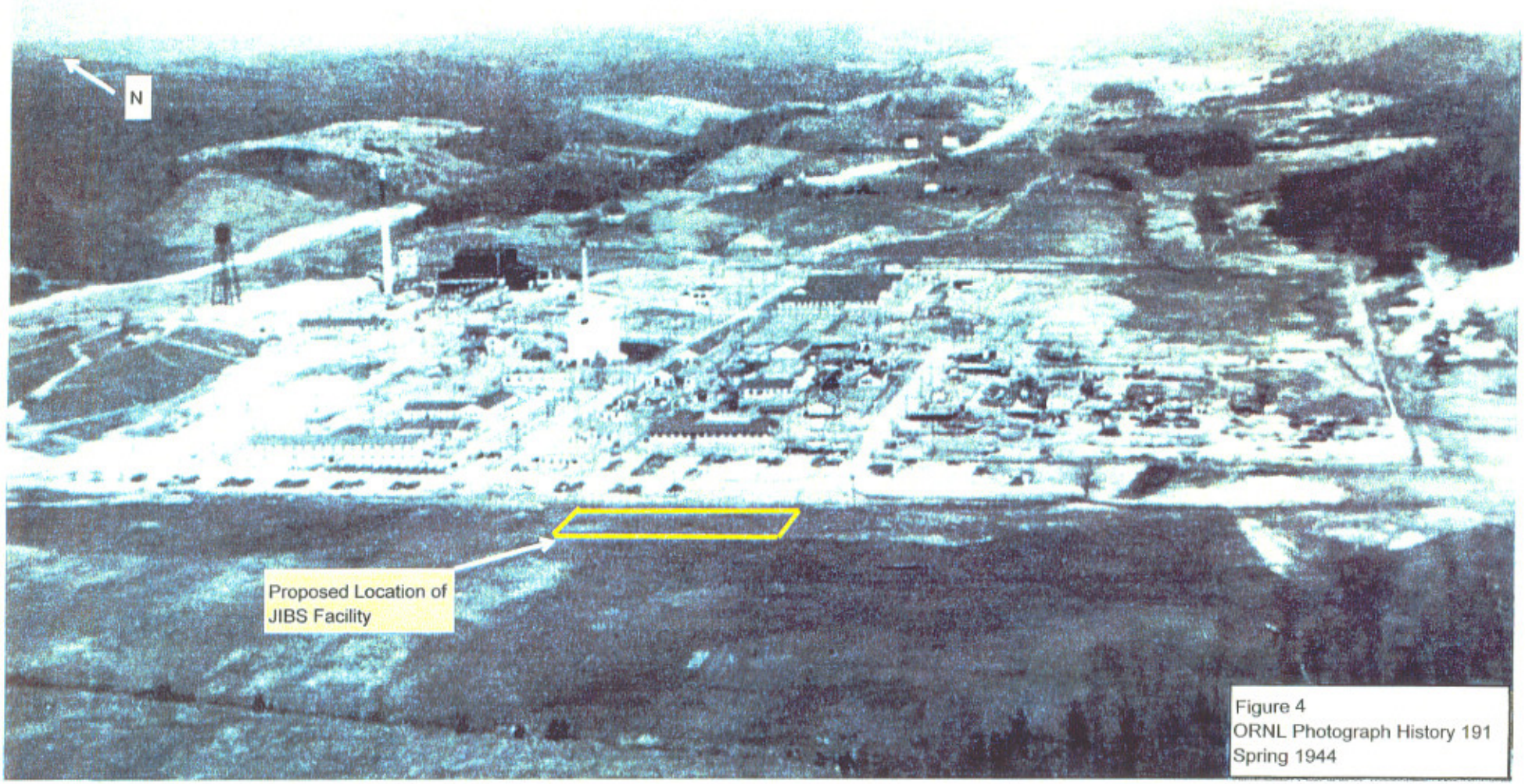
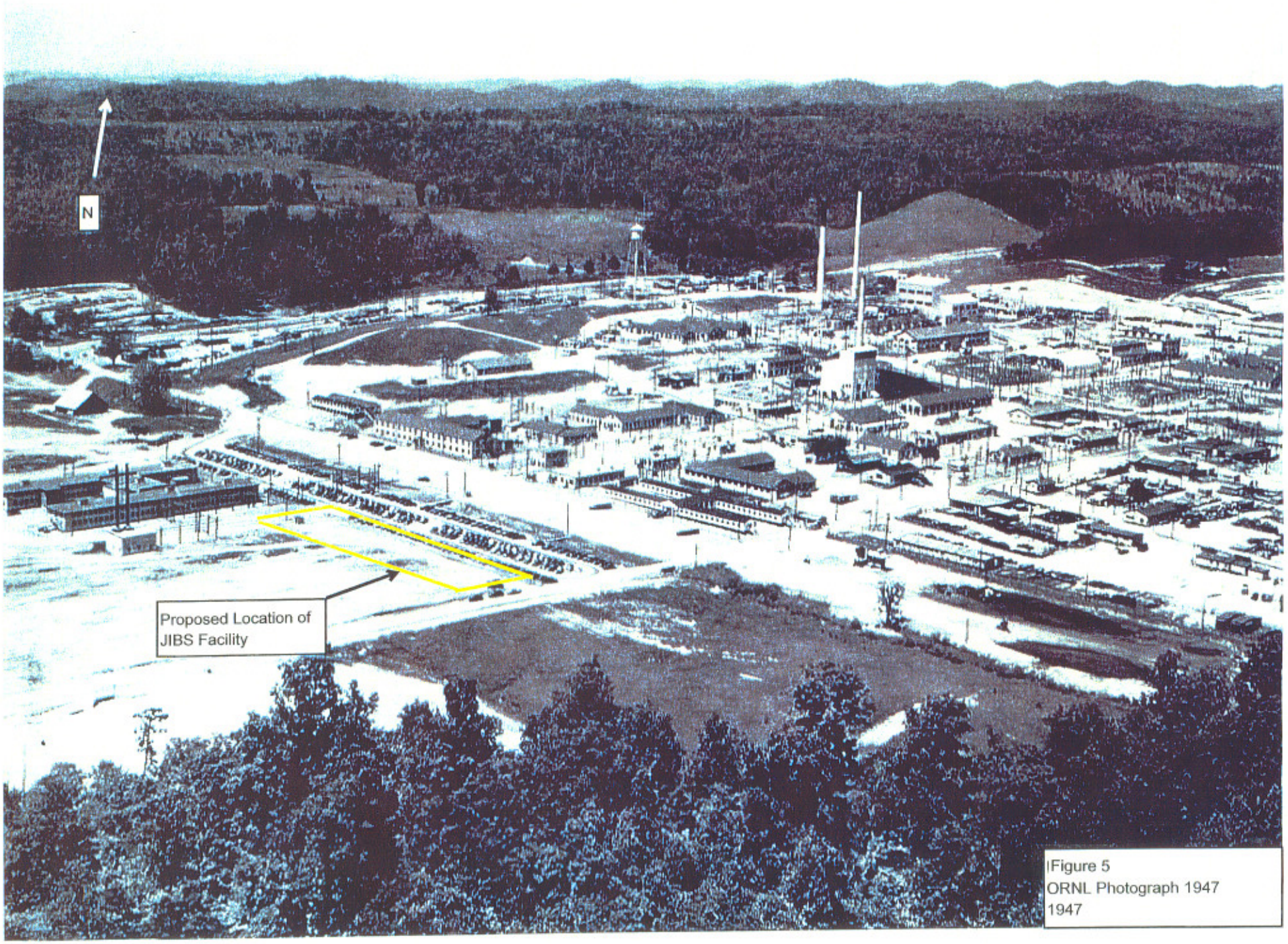


Figure 4
ORNL Photograph History 191
Spring 1944



|Figure 5
ORNL Photograph 1947
1947

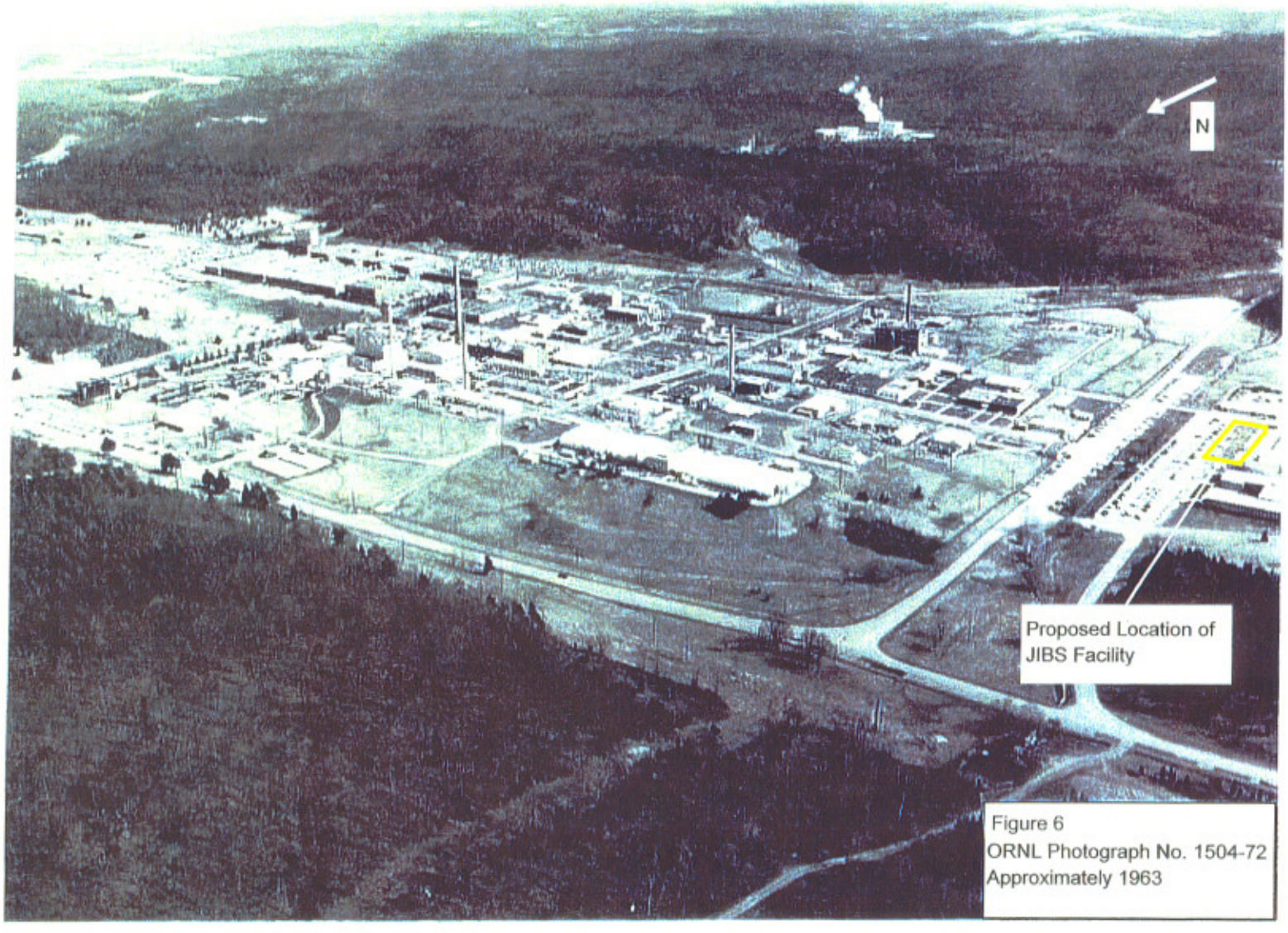
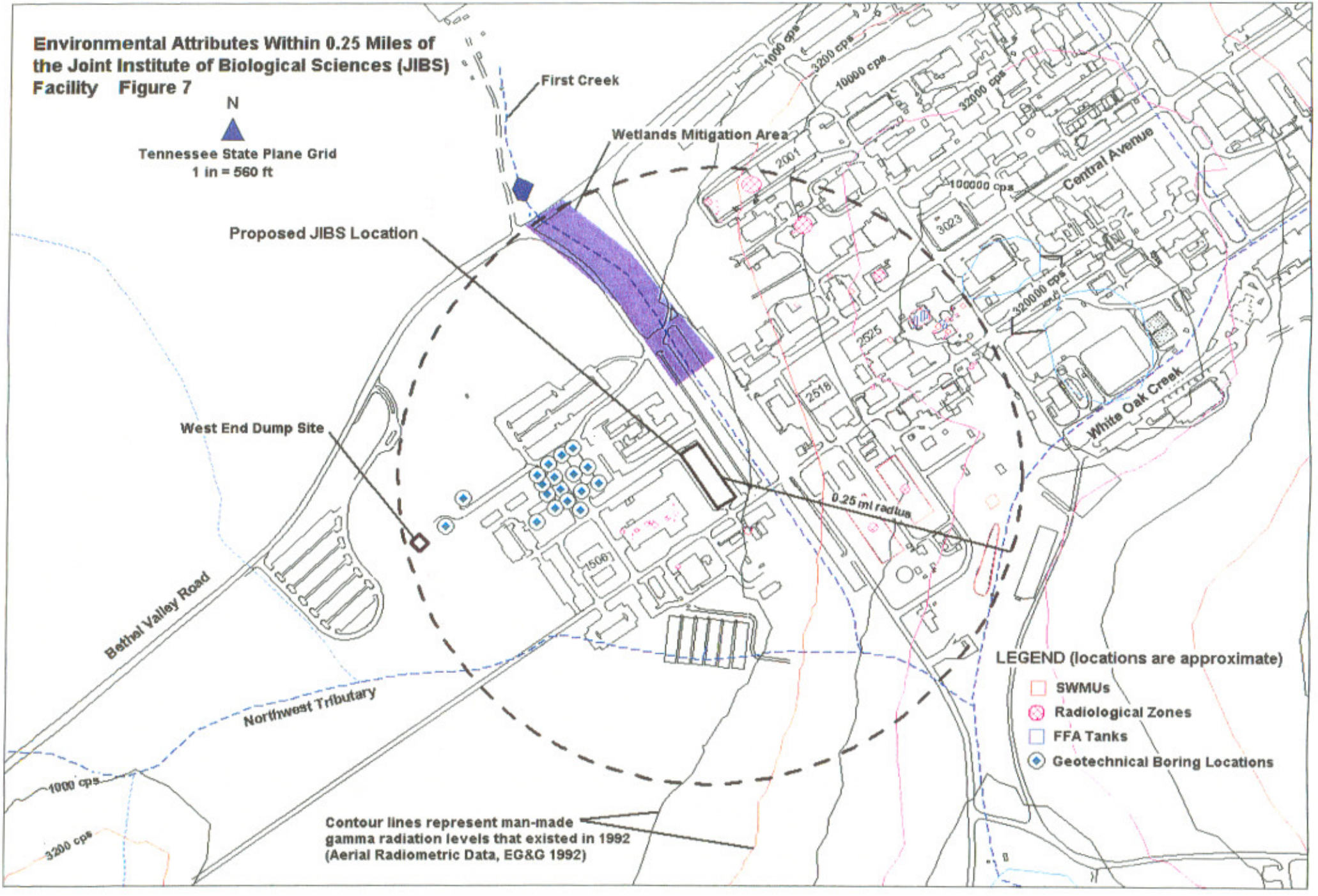


Figure 6
ORNL Photograph No. 1504-72
Approximately 1963


Environmental Attributes Within 0.25 Miles of the Joint Institute of Biological Sciences (JIBS) Facility Figure 7
N
Tennessee State Plane Grid
1 in = 560 ft
First Creek
Wetlands Mitigation Area
Proposed JIBS Location
West End Dump Site
0.25 mi radius
Central Avenue
White Oak Creek
Bethel Valley Road
Northwest Tributary
1000 cps
3200 cps
10000 cps
32000 cps
100000 cps
320000 cps
2001
3023
2525
2518
1500
LEGEND (locations are approximate)
SWMUs
Radiological Zones
FFA Tanks
Geotechnical Boring Locations
Contour lines represent man-made gamma radiation levels that existed in 1992 (Aerial Radiometric Data, EG&G 1992)

3.4 Records Review

The City of Oak Ridge and TDEC were contacted regarding information on past releases within and adjacent to the proposed property transfer parcel. In addition, the TVA, U.S. Army Corps of Engineers (USACE), and the DOE Realty Office were contacted concerning records of prior property ownership/land use and information on past storage, release, or disposal of hazardous substances on the proposed property transfer parcel. None of the above entities had information concerning past storage, release, or disposal of hazardous substances on the proposed property transfer parcel or adjacent areas. TVA and USACE indicated that any historical records they may have had regarding ownership/land use of the property were either transferred to another governmental agency following WWII or are in the National Archives. However, historical USACE records of the property surveys of the land purchased for the Manhattan Project[12] show that the proposed property transfer parcel was part of a tract owned by J. H. Anderson.

Various ORNL records were also reviewed for information on past storage, release, and disposal of hazardous substances on the proposed property transfer parcel. No evidence of hazardous substance use, storage, or disposal was found. A list of the records reviewed and a signed statement from the DOE Realty Office indicating that a review of real estate records did not indicate any hazardous substance activity on the Property are included in Appendix C. ORNL records were also reviewed for information on the environmental condition of the property. A summary is provided in Section 3.8.

3.5 Interviews

Interviews and/or telephone conversations were held with employees involved in or having knowledge of past or present operations on the Property regarding any hazardous substance storage, use, or disposal that may have occurred on the Property. In addition, the City of Oak Ridge, TDEC, TVA, USACE, and DOE Realty Office were contacted as described in Section 3.4. The interviews/telephone conversations did not indicate any evidence of hazardous substance activity on the proposed property transfer parcel; although, some hazardous substance activity (e.g., laboratory chemical usage) was noted on properties (i.e., Building 1505) approximately 100 feet west of the proposed property transfer parcel as discussed in Section 3.2. Appendix D contains a list of individuals contacted.

3.6 Sampling Data

As shown in Figure 2, a considerable amount of sampling data is available for the Property and adjacent properties. A more detailed description of the sampling data associated with the Property and adjacent properties is provided below.

3.6.1 Sampling Data for JIBS Property

The available sampling data includes data from three recent, separate sampling events performed at the Property: 1) a radiological surface survey (September 2004), 2) a geotechnical investigation (November 2004), and 3) an environmental screening and geotechnical investigation (March 2005).

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[12] Kingston Demolition Range Photos, Pre-1942 Home Places, Section A, Pellissippi Genealogical and Historical Society, Clinton, TN (CD available through American Museum of Science and Energy).

3.6.1.1 Radiological Surface Survey, September 2004

A radiological surface survey and direct contamination survey of the Property for beta/gamma was performed on September 4 through 5, 2004. No contamination above background levels was detected during the survey.[13]

3.6.1.2 Geotechnical Investigation, November 2004

On November 4, 2004, eight soil borings were completed on the Property as part of the geotechnical investigation for siting the JIBS facility. A cone penetrometer was used to advance the borings to refusal, which occurred at 8 to 10.5 ft BLSD. No environmental samples were collected; however, a photoionization detector (PID) was used to collect vapor measurements from each open hole at 5 ft BLSD and at the depth of refusal. No VOCs were detected in any of the measurements. Radiological surveys were also performed during the drilling operations and on the drilling equipment after cessation of drilling. No radiological contamination was detected above background levels.

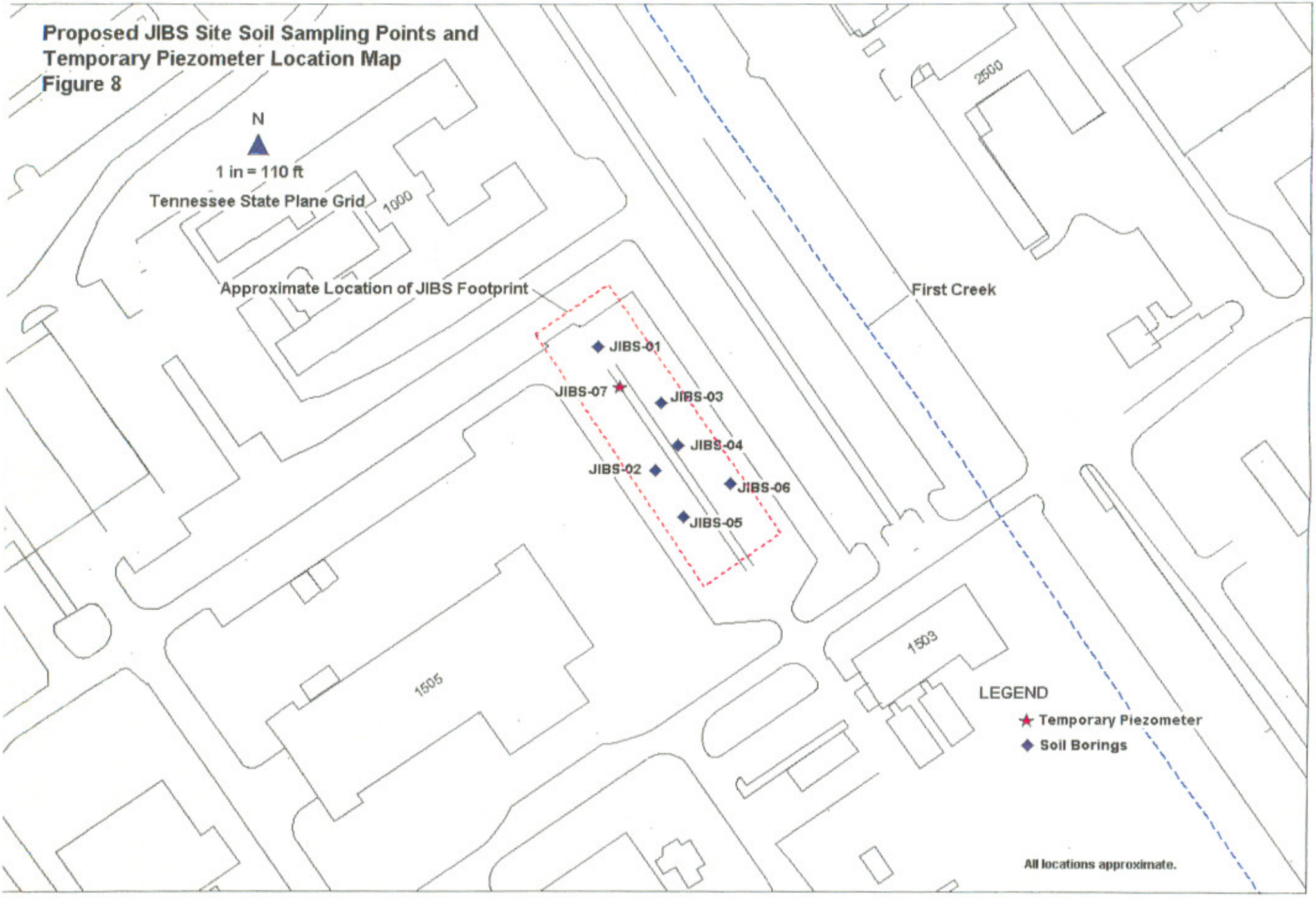
3.6.1.3 Environmental Screening and Geotechnical Investigation, March 2005

During March 28 through 31, 2005, six soil borings and one rock core boring were drilled on the Property as part of the environmental screening and geotechnical investigation of the site (see Figure 8). The borings were advanced to auger refusal near the soil-bedrock interface. The rock core boring was advanced into the soil and rock to a total depth of 42.8 feet BLSD and was converted to a piezometer for the purpose of collecting a grab sample of groundwater. The location of the rock core boring/temporary piezometer corresponded to the approximate location of the elevator piston shaft (a 12 inch diameter hole to 37 ft BLSD), which is required for the JIBS building elevator and is the only part of the JIBS facility that will extend below 3 m (10 ft). The drill rig was equipped with a split spoon sampler to collect soil samples at 5 foot intervals (to auger refusal, nominally 8 to 10 feet BLSD). Rock core samples were collected at the soil-rock interface (at about 10 feet BLSD), at 20 feet BLSD, and at 40 feet BLSD. Soil and groundwater samples were collected for ICP metals, VOC, and radiological analyses. The rock samples were collected for ICP metals and radiological analyses since rock core cannot be reliably analyzed for VOCs. Soil samples for volatile organic analyses were collected in accordance with EPA Method 5035A. Methods 8260B and 6010B were used for VOC and metals analyses, respectively. EPA Method 7471A was used to analyze soil and rock samples for mercury and Method 7470A was used to analyze the groundwater sample for mercury. EPA Methods 900.0 and 901.1 were used for gross alpha/gross beta and gamma spectroscopic analyses, respectively. The SAPs for the environmental screening and geotechnical investigation are included in Appendix E. Groundwater was only encountered in the temporary piezometer. Groundwater was encountered at a depth of 8.65 feet BLSD in the piezometer at 24 and 36 hours after installation. The environmental sampling results are included in Appendix F and summarized below.

3.6.1.3.1 VOCs in Soil

Several VOCs were detected sporadically throughout the Property in soil samples at extremely low levels (see Table 2 in Appendix F). For the VOCs for which background data were available (i.e., 2-Butanone, acetone, methylene chloride, and toluene), all but the acetone values were at or below the background values. The highest VOC detections reported were for acetone. Acetone was detected in 10 out of the 13 soil samples. However, upon further investigation, it was determined that the sampling technicians used isopropanol (70%) wipes to decontaminate the

[13] Oak Ridge National Laboratory, *ORNL Radiological Survey*, Survey No. SAAS-151068, Operational Safety Services Division, Radiological Support Services, September 7, 2004.


Proposed JIBS Site Soil Sampling Points and
Temporary Piezometer Location Map
Figure 8
N
1 in = 110 ft
Tennessee State Plane Grid
1000
2500
Approximate Location of JIBS Footprint
First Creek
JIBS-01
JIBS-07
JIBS-03
JIBS-04
JIBS-02
JIBS-06
JIBS-05
1505
1503
LEGEND
Temporary Piezometer
Soil Borings
All locations approximate.

sampling equipment and did not allow the equipment to completely air dry in all cases after decontamination prior to collection of the following sample. The analytical laboratory confirmed that the quantitation of either or both isopropanol and acetone may have been compromised. Identification and quantitation of acetone is difficult when large amounts of isopropanol are present and likely resulted in the reported acetone concentrations being biased high. This is further substantiated by the fact that the soil samples collected the first part of each day of drilling, when the sampling equipment was most likely to have thoroughly dried from the prior decontamination, had low (i.e., less than background values) or undetected acetone concentrations.

For the other sporadically-detected VOCs for which background data were not available (i.e., benzene, ethylbenzene, xylenes, naphthalene, 1,2,4-Trimethylbenzene, and 1,3,5-Trimethlybenzene), their presence could indicate the potential presence of minor historical fuel leaks or possible residuals from application of oil as a dust suppressant in the parking area prior to when it was paved. However, the detections are extremely low and well below the EPA Region IX Preliminary Remediation Goals (PRGs) that are often used as soil screening levels at remediation sites. As a result, none of these VOCs are believed to indicate the presence of hazardous substance contamination at the Property which would preclude transfer of the Property. In addition, the JIBS facility has features that will mitigate VOCs, including the building's slightly positive pressure, use of large volumes of outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants.

3.6.1.3.2 Metals in Soil and Rock

Only one metal (i.e., lead) was detected in any of the soil samples above background levels (i.e., 110 mg/kg). Although background levels for lead in clay/clay-loamy soil are 10 to 70 mg/kg, it is not uncommon for soils in urban areas, particularly along city streets, to have greater than 200 mg/kg lead. This single detection of lead in the soil above background levels is not believed to indicate the presence of hazardous substance contamination at the Property that would preclude transfer of the Property and is well below EPA and Tennessee action and/or screening levels for lead in soil.[14]

Several metals were detected in each of the three rock samples, but at very low levels, much lower than the levels detected in the overlying soils.

3.6.1.3.3 Groundwater

No VOCs were present and only one metal (i.e., arsenic at 5.2B µg/L; B indicates the result is between the instrument detection limit and the reporting limit) was detected above background levels in the groundwater sample collected from the temporary piezometer installed at the location of the proposed JIBS elevator piston. Although the concentration of arsenic in the groundwater sample is slightly higher than the background value (2.6 µg/L), the concentration is lower than the National Primary Drinking Water Standard (10 µg/L).

[14] EPA has a hazard standard of 400 ppm by weight in play areas (66 FR 1211). Also, Tennessee Superfund uses the EPA Region IX Preliminary Remediation Goals (PRGs) as soil screening levels. The Region IX PRG for lead in residential soil is 400 mg/kg.

3.6.1.3.4 Radioactive Contamination

No radioactive contamination above background levels was detected in any of the environmental samples collected in March 2005.The results of the March 2005 environmental sampling indicate that hazardous substances are not present in the in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property.

3.6.1.3.5 Vapor Measurements

In addition to the collection of soil, rock, and groundwater samples in March 2005, vapor measurements were obtained during drilling operations using a PID (at all seven boring locations). Vapor measurements were obtained of the soil and rock sampled and any cuttings that were brought to the surface during drilling operations. Radiological surveys were also performed during the boring activities. Drilling equipment was subjected to a radiological survey prior to its use at the Property and after drilling operations ceased. In addition, the soil and rock samples collected for analysis and soil cuttings brought to the surface during drilling operations were surveyed for radioactivity. The PID and radiological survey equipment were standardized and calibrated as required by internal procedures. Vapors were detected at levels slightly above background in two borings. The PID measurement at the 6 to 9.5 foot interval BLSD in borehole JIBS-02 was recorded at 0.1 ppm and background for that boring was 0.0 ppm. Likewise at the 20 foot level BLSD in JIBS-07 (rock core hole), a PID measurement of 1.2 ppm was recorded and background for that hole was 1.1 ppm. The detection of vapors at levels slightly above background levels is attributable to the presence of a gasoline container that was placed near the drill rig. The presence of the gasoline container also explains the increase in vapor background level (i.e., from 0 to greater than 1 ppm). No radiological contamination was detected on the samples and cuttings, or on the drilling equipment at the cessation of drilling operations.

3.6.2 Sampling Data for Adjacent Properties

In addition to the radiological surveys, PID measurements, geotechnical borings, and environmental samples from the recent investigations, over 200 soil, surface water, sediment, and groundwater sampling points were evaluated in the Remedial Investigation/Feasibility Study (RI/FS) for the Bethel Valley Watershed.[15] No samples were collected on the subject Property during preparation of the RI/FS due to the fact that there was no evidence of contamination.

As identified in Figure 5-14 of the RI/FS,[16] movement of groundwater and surface water under and on the Property is toward the southeast to White Oak Creek and its tributaries (see Figure 3 for the generalized groundwater contours and flow direction in the area). Various radionuclides and inorganic compounds have been detected in the groundwater in West Bethel Valley and in the vicinity of the Property. Five groundwater monitoring wells are located in the general vicinity of the property west of First Creek, which acts as a shallow groundwater divide between West Bethel Valley and the Central Bethel Valley 2000 Area, as shown in Figure 3. Four of these wells, 533, 535, 536, and 810, are shallow wells ranging in depth from 15 to 19 feet below land surface datum (BLSD), whereas Well 2541 is a bedrock well and has a depth of 350 BLSD. A total of 3,222 chemical, including radiochemical, analyses were performed on these wells during 23 different sampling events from July 15, 1986, through March, 25, 2004. The following is a summary of detected results in these wells that exceeded the MCLs, groundwater contaminant

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15 Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

16 Ibid.

plumes, other monitoring data, and a summary and conclusions for the vapor intrusion to indoor air pathway.

3.6.2.1 VOCs in Groundwater

The groundwater monitoring well closest to the Property, Well 536, is approximately 30 feet to the east and down-gradient from the property (the localized shallow groundwater flow in the vicinity of Wells 536 and 810 is toward First Creek). Well 536 had laboratory-reported MCL exceedances of one VOCs, methylene chloride (two exceedances in four results, with a maximum reported value of 0.022 mg/L). However, methylene chloride, a common laboratory contaminant, was also detected in the associated trip blanks and, as a result, was validated as laboratory method blank contamination. Another VOC, 2-Hexanone, was also detected on one occasion at 0.002J mg/L (J represents an estimated value below the reporting limit but above the method detection limit, meaning that although detected, the concentration may not be quantifiable with acceptable precision).

Two other VOCs were detected above MCLs in wells in the vicinity of the Property. Well 533, approximately 600 ft to the west and side-gradient of the property (shallow groundwater flow is toward the south from Well 533), and Well 542, approximately 560 ft east of the property and on the opposite side of First Creek, each had a reported exceedance of the 1,2-Dichloropropane MCL at 0.006 mg/L (the MCL is 0.005 mg/L). Both exceedances occurred in July 1986. Tetrachloroethylene was also reported in Well 542 in July 1986 at 0.0276 mg/L. The MCL for tetrachloroethylene is 0.005 mg/L.

In addition to the VOC detections above MCLs, several other VOCs, primarily toluene, were detected at low levels in the vicinity of the property, primarily in wells east of First Creek. Toluene was detected in wells on both sides of First Creek (i.e., Wells 533, 535, and 4008) at levels ranging from 0.001J to 0.004J mg/L[17]. Other VOCs, such as carbon disulfide, 2-Butanone, benzene, 1,2-Dichloroethene, methylene chloride, were detected only in wells east of First Creek (i.e., Wells 541, 542, and 811) and at levels ranging from 0.0005J to 0.008 mg/L.[18]

3.6.2.2 Metals in Groundwater

In addition of the VOC detections discussed previously, Well 536 had reported isolated MCL exceedances of antimony (0.0804 mg/L), beryllium (0.005 mg/L), cadmium (0.0121 mg/L), gross alpha (68.4 pCi/L), and gross beta (97 pCi/L).

3.6.2.3 SVOCs in Groundwater

One semi-volatile organic compound (SVOC) was detected above the MCL in Well 810, approximately 170 feet east and down-gradient of the property. Bis(2-ethylhexyl)phthalate was detected above the MCL in one of 9 results at a value of 0.024 mg/L. No SVOCs were detected above MCLs in any of the other wells near the property. Well 810 also had reported isolated exceedances of beryllium (0.029 mg/L) and cadmium (0.0086 mg/L). No radiochemical constituents were detected above MCLs in Well 810.

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[17] J represents an estimated value below the reporting limit but above the method detection limit, meaning that although detected, the concentration may not be quantifiable with acceptable precision.

[18] Ibid.

3.6.2.4 Radiochemical Constituents in Groundwater

In addition to the VOC detection discussed previously, Well 533 also had reported exceedances of MCLs or Derived Concentration Guides (DCGs)[19] for four radiochemical constituents—gross alpha (three MCL exceedances in 5 results, with a maximum value of 32.1 pCi/L), gross beta (three MCL exceedances in 5 results, with a maximum value of 675 pCi/L), Thorium-232 (one DCG exceedance in 3 results, with a maximum value of 2.96 pCi/L), and Uranium-234 (one DCG exceedance in 3 results, with a maximum value of 84.46 pCi/L).

Tritium exceeded the MCL on one occasion in 1991 at Well 535 (31,336.9 pCi/L), approximately 350 ft to the north and side-gradient of the Property (localized shallow groundwater flow in the vicinity of this well is to the east), and has been detected in the wells 30 and 170 feet east of the property (Wells 536 and 810). Other radiochemical MCL exceedances at Well 535 include gross alpha (12 exceedances in 34 results with a maximum value of 275 pCi/L), gross beta (14 exceedances in 34 results with a maximum value of 499.3 pCi/L), and Radium-226 (one exceedance in 8 results with a maximum value of 6.8 pCi/L).

Two radiochemical constituents have been reported in excess of MCLs in the deep well, Well 2541, located approximately 720 ft northwest and side-gradient of the property (shallow groundwater flow is toward the south from Well 2541). Gross beta exceeded the MCL in three of four results, with a maximum value of 987.71 pCi/L, and Strontium-90 exceeded the MCL in one of one result at 125.24 pCi/L.

3.6.2.5 Groundwater Contaminant Plumes

The most significant groundwater contaminant plumes near the Property are Core Hole 8 (approximately 210 ft to the northeast at the nearest point), Central Bethel Valley South Area (closest plume is approximately 480 ft to the southeast), and SWSA 3 (greater than 2000 ft west of the Property at the nearest point), and consist primarily of Strontium-90 and tritium. The Core Hole 8 plume and a small tritium plume in the Central Bethel Valley South Area are the only groundwater plumes known to be within a 0.25-mile radius of the property as shown in Figure 3. Although VOCs were detected in several areas of ORNL, the only identifiable plume is in East Bethel Valley, approximately 6,500 ft from the Property.[20] There are no discernible plumes or obvious release areas for VOCs in the Central Bethel Valley 2000 area or in the eastern portion of West Bethel Valley (in the vicinity of the Property). None of these contaminant plumes are known to extend beneath the Property, although Strontium-90, tritium, and a few isolated occurrences of VOCs have been detected in the wells within 170 feet east of the property, as discussed previously.

The Core Hole 8 plume migrates across the Central Bethel Valley 2000 Area (east of First Creek and east of the Property) and discharges to First Creek north of the Property. The lateral extent and depth are not completely characterized; the primary constituent in the plume is Strontium-90. A groundwater collection and transmission system was installed in December 1994 to intercept groundwater containing Strontium-90 prior to discharge to First Creek. In March 1998, an additional groundwater interceptor trench was installed and connects to the original system.

Tritium is present in groundwater throughout the area and in a groundwater contaminant plume in the Central Bethel Valley South Area (east of First Creek and east of the Property). The lateral

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19 DOE. *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, February 1990.

20 Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

extent of elevated tritium concentrations is well defined. As shown in Figure 3, small tritium plumes located in Central Bethel Valley discharge to First Creek north and south of the Property.

Contaminants, such as Strontium-90, are present in a long (> 900 m [3000 ft]), narrow (approximately 80 m [250 ft]) plume in the vicinity of SWSA 3, extending to the Northwest Tributary, greater than 2000 ft west of the Property at the nearest point.

3.6.2.6 Other Monitoring Data

Routine monitoring associated with the ORNL National Pollutant Discharge Elimination System Permit at nearby outfalls does not indicate contamination sources in the parcel proposed for transfer. Biological Monitoring and Abatement Program stream monitoring of the receiving stream from the West Campus area also does not indicate chemical contamination from the Property.

As described in Section 3.1, no evidence of hazardous substance use, storage or disposal on the Property was identified during the environmental baseline assessment conducted for this CDR. As described in Section 3.7, radiological surveys and PID measurements conducted during recent sampling events at the Property did not identify any surface or subsurface radiological or VOC contamination above background levels, with the exception of two PID readings slightly above background levels in March 2005 that were attributable to the presence of a gasoline container placed near the drill rig. In addition, there is no evidence of VOCs being used, stored, or disposed on the Property.

3.6.2.7 Data Summary and Conclusions for Vapor Intrusion to Indoor Air Pathway

The *EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (VI Guidance) provides guidelines regarding distance to contamination, factors to be considered, and VOC trigger levels for screening purposes.[21] With the VI Guidance, 100 feet is considered to be the maximum lateral or vertical transport distance unless significant preferential pathways exist. Although VOCs were detected in several areas of ORNL, the only identifiable plume is in East Bethel Valley,[22] approximately 6,500 ft (1.23 miles) from the Property. As discussed above, no VOCs were present in the March 2005 groundwater sample from the temporary piezometer installed at the location of the proposed JIBS elevator piston. However, several VOCs were sporadically detected at extremely low levels (parts per billion range) in the March 2005 soil samples from the Property and several VOCs were detected in groundwater in the vicinity of the Property at low, mostly estimated (i.e., detected but may not be quantifiable with acceptable precision), levels. The soil VOC detections could indicate the potential presence of minor historical fuel leaks or possible residuals from application of oil as a dust suppressant in the parking area prior to when it was paved. However, the detections in the soil are extremely low and well below the EPA Region IX Preliminary Remediation Goals (PRGs) that are often used as soil screening levels at remediation sites and do not indicate the presence of hazardous substance contamination that would preclude transfer of the Property. Two VOCs,1,2-Dichloropropane (one detection at 0.006 mg/L in each of Wells 533 and 542) and tetrachloroethylene (one detection at 0.0276 mg/L in Well 542), were detected at levels exceeding MCLs. EPA's VI Guidance sets the trigger levels for 1,2-Dichloropropane and tetrachloroethylene at 0.035 mg/L and 0.011 mg/L, respectively, for an incremental individual lifetime cancer risk of 10^{-5}. Neither of these wells is located within 100 ft of the Property. Well

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21 EPA. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, November 29, 2002.

22 Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

533 is located approximately 600 ft to the west and side-gradient of the property. Shallow groundwater flow from Well 533 is south toward the Northwest Tributary. Any potential contamination from this well is likely to flow toward the Northwest Tributary and into First Creek and not toward the Property. Well 542 is located approximately 560 ft east of the Property, across First Creek. Shallow groundwater flow from Well 542 is south toward White Oak Creek and should not affect the Property. Discussions with geologists familiar with the ORNL site have confirmed that there are no known preferential pathways between these wells and the Property.

Based on the fact that: 1) the only VOCs detected at greater than background levels by PID during investigations at the Property in 2004 and 2005 were two isolated detections 0.001 ppm above background levels attributable to a gasoline container placed next to the drill rig, 2) although several VOCs were detected sporadically at low levels (in the parts per billion range) in the soil samples, no VOCs were detected in the groundwater sample collected at the Property in March 2005, 3) VOCs have been detected in groundwater on adjacent property in a limited number of instances, 4) although one VOC detection in groundwater on adjacent property exceeded the trigger level in the EPA VI Guidance (tetrachloroethylene in Well 542), the well is located across First Creek, a shallow groundwater divide, from the Property, 5) the distance between the most of the groundwater wells and the Property is greater than 100 feet (Well 536 is the only well less than 100 feet from the Property), and 6) the absence of known preferential pathways between the groundwater wells and the Property, DOE has concluded that the vapor intrusion pathway is incomplete. In addition, the JIBS facility has features that will mitigate VOCs, including the building's slightly positive pressure, use of large volumes of outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants. See Appendix G for a more detailed evaluation of the vapor intrusion pathway as it relates to the Property.

3.7 Radiological Survey Data

Radiological surveys were conducted during the November 2004 geotechnical investigation and March 2005 environmental screening at the Property, which involved 8 and 7 borings, respectively. No radiological contamination above background levels was detected during either of these surveys. In addition, a radiological surface survey was conducted of the Property in September 2004 and did not identify any radiological contamination above background levels. Radiological surveys were also conducted during installation of eighteen geotechnical borings in 2000 in support of the Proposed Laboratory for Comparative and Functional Genomics. These borings were located in the West Campus area to the west of Building 1000, approximately 330 to 1040 feet from the proposed property. The drilling equipment associated with the geotechnical borings was surveyed and found to be free of radiological contamination. In addition, the shallow foundation excavation for the Laboratory for Comparative and Functional Genomics in the West Campus area in 2002 was found to be free of radiological contamination.

However, radiological contamination exists along First Creek, approximately 200 ft to the east of the Property. The ROD for Interim Actions in Bethel Valley[23] identifies sediment contamination in First Creek (small areas northeast of the Property and a larger area southeast of the Property) and the Northwest Tributary, including Cesium-137, Cobalt-60, mercury, and polychlorinated biphenyls (PCBs).

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[23] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

3.8 Summary

A summary of the environmental conditions of the proposed property transfer area is provided below and is based on review of the records, sampling data, and aerial and ground-level photographs, interviews and a visual and physical inspection of the Property and adjacent properties as described previously in this section.

3.8.1 Floodplain and Wetlands

Based on previous surveys conducted at ORNL, the Property does not lie within or contain any wetlands or floodplains.[24] However, the Property is bordered on the north by a Research Park Aquatic and Natural Reference Area.[25]

3.8.2 Natural Resources

Based on previous surveys conducted at ORNL, no ORR environmentally sensitive areas lie within the Property. ORR environmentally sensitive areas are defined as including threatened and endangered (T&E) species and their habitats, sensitive landscape elements and rare natural communities associated with T&E species, as well as necessary buffers.[26]

3.8.3 Cultural Resources

No pre-WWII structures or prehistoric archaeological sites eligible for inclusion on the National Register of Historic Places were identified on the Property. The Graphite Reactor, Building 3001, located approximately 1,890 feet northeast of the Property, is the nearest structure currently included in the National Register of Historic Places. The Property is also outside the boundaries of the proposed Historic District at ORNL.[27,28]

3.8.4 Hazardous Substances, Hazardous Wastes, and Petroleum Products

As described in Section 3.6, thirteen soil samples were collected on the Property at 5-foot depth intervals to the top of bedrock in March 2005. Depth to bedrock ranged from 7.5 to 9.5 ft BLSD. In addition, a groundwater sample was collected from a temporary piezometer installed in March 2005 at the proposed location of the JIBS elevator piston, the only part of the JIBS facility that will exceed 3 m (10 ft) in depth.

As described in Section 3.6, several VOCs were detected sporadically throughout the Property in the soil samples at extremely low (parts per billion range) levels, but none of these detections are believed to indicate the presence of hazardous substance contamination at the Property which would preclude transfer of the Property. In addition, the JIBS facility has features that will mitigate VOCs, including the building's slightly positive pressure, use of large volumes of

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[24] Rosensteel, B.A. *Wetland Survey of the X-10 Bethel and Melton Valley Groundwater Operable Units at the Oak Ridge National Laboratory, Oak Ridge, Tennessee*, ORNL/ER-350, Oak Ridge National Laboratory, Oak Ridge, TN, March 1996.

[25] Rosensteel, B.A. *Wetland Survey of the X-10 Bethel and Melton Valley Groundwater Operable Units at the Oak Ridge National Laboratory, Oak Ridge, Tennessee*, ORNL/ER-350, Oak Ridge National Laboratory, Oak Ridge, TN, March 1996.

[26] Awl, D. J., Pounds, L.R., Rosensteel, B.A., King, A.L., and Hamlett, P.A. *Survey of Protected Vascular Plants on the Oak Ridge Reservation, Oak Ridge, Tennessee*, ES/ER/TM-194, Lockheed Martin Energy Systems, Inc., Oak Ridge, TN, June 1996.

[27] Carver, M. and M. Slater. *Architectural/Historical Assessment of the ORNL*, ORNL/M-3244, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January 1994.

[28] DuVall, Glyn D. *An Archaeological Reconnaissance and Evaluation of the Oak Ridge National Laboratory, Oak Ridge Reservation, Anderson and Roane Counties, Tennessee*, ORNL/M-3245, January 1994.

outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants. VOCs were not present in the groundwater sample collected from the temporary piezometer installed at the location of the proposed JIBS elevator piston.

Only one metal (i.e., lead) was detected in any of the soil samples above background levels and one metal (i.e., arsenic) was detected above background levels in the groundwater sample. This single detection of lead in the soil above background levels is not believed to indicate the presence of hazardous substance contamination at the Property that would preclude transfer of the Property and is well below EPA and Tennessee action and/or screening levels for lead in soil.[29] Although the concentration of arsenic in the groundwater sample is slightly higher than the background value, the concentration is lower than both the National Primary Drinking Water Standard and the Tennessee Domestic Water Supply Standard but also is not believed to indicate the presence of hazardous substance contamination at the Property that would preclude transfer of the Property.

There are no spills or releases of hazardous substances that are known to have impacted the Property. Small areas of oily residues are visible in the asphalt parking lot portion of the Property. There are no records or anecdotal evidence indicating past or current storage, releases, or disposal of hazardous substances, hazardous wastes, or petroleum products in or on the Property.

Based on the record and document reviews, inspections, environmental sampling, and interviews conducted, there are no hazardous substances, hazardous wastes, or petroleum products present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property.

3.8.5 Underground Storage Tanks

There are no known underground storage tanks (USTs) at the Property. Nearby USTs are shown in Figure 2. The UST northwest of Building 1505, a former diesel fuel emergency generator tank, was closed in place in 1997. There are no known releases from this closed UST. In addition, the UST is on the opposite side of Building 1505 from the proposed property and should have no impact on construction activities at the property.

3.8.6 Radioactive Substances and Contamination

As described in Section 3.6, soil samples were collected on the Property at 5-foot depth intervals to the top of bedrock in March 2005. Depth to bedrock ranged from 7.5 to 9.5 ft BLSD. In addition, a groundwater sample was collected from a temporary piezometer installed in conjunction with the soil sampling in March 2005. Analysis of these samples using EPA Methods 900.0 and 901.1 showed no radioactive constituents were present at greater than background levels. In addition, to the soil samples, radiological surveys conducted during the March 2005 environmental screening, November 2004 geotechnical investigation, and September 2004 radiological surface survey of the Property did not identify any radiological contamination above background levels.

As described in Section 3.7 and confirmed by environmental sampling, there are no known radionuclides at concentrations greater than background levels or radioactive contamination on

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[29] EPA has a hazard standard of 400 ppm by weight in play areas (66 FR 1211). Also, Tennessee Superfund uses the EPA Region IX Preliminary Remediation Goals (PRGs) as soil screening levels. The Region IX PRG for lead in residential soil is 400 mg/kg.

the Property. In terms of adjacent property, several disposal areas (i.e., SWSA 3, the Contractor's Landfill, the Closed Scrap Metal Area, and the West End Dump Site) containing radioactive substances are located in the West Bethel Valley Area. However, with the exception of the West End Dump Site, a 10 ft by 8 ft site located just under 0.25 mi. west of the proposed site, the disposal areas are located greater than 0.5 mi. west of the proposed site. The shallow groundwater and surface water flow direction is from the disposal areas to the southeast toward the Northwest Tributary and not toward the proposed site. The inactive West End Dump Site consists of several mounds of debris and asbestos-containing material and will be investigated for potential radiological contamination in the future as part of the ROD for Interim Actions in Bethel Valley.[30] In the two wells closest to the property, there has only been a single isolated groundwater MCL exceedance of each of gross alpha and gross beta activity. However, groundwater beneath the property may contain radionuclides.[31]

3.8.7 Polychlorinated Biphenyls

There are no known PCBs or any equipment with PCBs on the Property.

3.8.8 Asbestos

There is no known asbestos on the Property.

3.8.9 Environmental Permits

No environmental permits will be affected by this land transfer.

4.0 Nature/Extent of Contamination

In accordance with CERCLA Section 120(h), reviews of government records, title documents, and aerial and ground-level photographs; visual and physical inspections of the Property and adjacent properties; and interviews with employees were conducted to identify any areas on the Property where hazardous substances and/or petroleum products were stored, released, or disposed. Additionally, environmental samples and PID measurements were obtained on the Property in March 2005 to provide site-specific data on the presence or absence of hazardous substances. Radiological surveys were also conducted on the Property during the March 2005 environmental screening, November 2004 geotechnical investigation (PID measurements were also obtained during this investigation), and September 2004 radiological surface survey. This information is summarized in Section 3.0 above. Based on the record and document reviews, inspections, environmental sampling and radiological survey results, and interviews conducted, there is no hazardous substance contamination present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. Section 3.6 describes the environmental sampling conducted.

In addition, the ROD for Interim Actions in Bethel Valley does not require any active remediation for the Property. The ROD for Interim Actions in Bethel Valley specifies the following land use control for unrestricted industrial areas: (1) control excavations or penetrations below 3 m (10 ft) and (2) prevent uses of the land more intrusive than industrial use above 3 m (10 ft).

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[30] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

[31] Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

Appendix A.1 of the ROD for Interim Actions in Bethel Valley identifies no further action for soil and land use controls as the selected remedy for this Property. The elevator piston necessary for the proposed JIBS facility will be the only part of the facility that will require penetration into soil and/or bedrock below a depth of 3 m (10 ft) and, thus, require an exception to the designated land use controls. The elevator piston will require a hole approximately 12 inches in diameter to a depth of approximately 37 ft BLSD, and will be cased and sealed at installation.

5.0 Analysis of Expected Future Use During Deferral Period

The parcel proposed for transfer (i.e., the Property) is located in the West Campus of ORNL. The Property is located within an industrial facility (i.e., a research and development laboratory) on land that is owned by the Federal government. The Property is in use as parking facilities for ORNL, DOE, subcontractor employees, and visitors. Adjacent properties are currently used for multipurpose basic science research and development in the areas of environmental and life sciences.

The transfer of the Property is necessary to facilitate the DOE's FRP for ORNL. The modernization plan includes the development of up to 24 new facilities. Five facilities identified in the plan have been constructed during the initial phase of the FRP. This CDR addresses one facility, the JIBS, to be developed during the initial phase. Additional CDRs may be necessary in the future to support completion of phase one or future phases of facilities development identified in the modernization plan.

The facility addressed under this CDR will be funded and built by the State of Tennessee. The facility will support basic science research and development in the areas of environmental and life sciences. The facility will include offices, laboratories, and meeting and breakout spaces. The facility will be used by ORNL researchers, along with other visiting scientists and researchers. The Property will not be used for residential, recreational, or child care purposes. Access to all facilities and areas surrounding them will be controlled by DOE through physical controls (e.g., badge readers) and administrative controls (e.g., signs). Groundwater below the Property will not be withdrawn as part of the planned uses. Analysis of environmental samples from the Property indicated that hazardous substances are not present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. The elevator piston necessary for the proposed JIBS facility will be the only part of the facility that will require penetration into soil and/or bedrock below a depth of 3 m (10 ft) and, thus, require an exception to the designated land use controls. The elevator piston will require a hole approximately 12 inches in diameter to a depth of approximately 37 ft BLSD, and will be cased and sealed at installation. There will be no groundwater contact during construction or occupancy once the casing has been set for the elevator piston. Based on sampling results, document/data reviews, interviews, and inspections, transfer of the Property and the excavation necessary for construction of the JIBS is protective of human health and the environment.

As noted in Section 4, "Nature/Extent of Contamination," the area proposed for transfer does not contain contaminated soils (i.e., soils contaminated with either/and/or radioactive or hazardous substances) that exceed background levels and is suitable for unrestricted industrial use with respect to soil excavation or disturbance. At the end of a pre-determined time period (expected to be 20 to 25 years), DOE, through the deed, will reacquire the Property for continuation of mission needs. DOE will continue to be responsible for any legacy contamination discovered after the date of transfer. In addition, the deed transferring the Property will contain numerous restrictions and prohibitions on the use of the property in order to assure the protection of the workers, the public, and the environment. The deed will contain language that will require use of the Property to be consistent with the FFA between DOE, EPA Region IV, and TDEC and the ROD for

Interim Actions in Bethel Valley.[32] The Grantee will be prohibited from extracting, utilizing, or consuming the groundwater below the Property and there will be no contact with groundwater after completion of the elevator piston installation. The deed will further provide language to the effect that title to the Property, shall, at the option of the Government, revert to and vest in the Government if the Grantee breaches certain use restrictions or prohibitions designed to protect the public health and safety and the environment, as set forth in the deed.

6.0 Risk Analysis

Based on process knowledge and history of the site, the Property was identified as an area that was unlikely to contain contaminants and, therefore, it was found that no further investigation was necessary. Furthermore, the Property was identified in the RI/FS as not likely to contain COCs. The property was also identified as an unlikely source unit and, therefore, not listed in Appendix A of the RI/FS.[33] In addition, it was not identified as a specific area for study in the Proposed Plan.[34] Therefore, the ROD for Interim Actions in Bethel Valley found the Property to be suitable for unrestricted industrial use with respect to soil excavation or disturbance to 3 m (10 ft) in depth. The JIBS building footers will be less than 10 ft BLSD. For the JIBS facility, the only exception to the designated land use controls will be for installation of an elevator piston, approximately 12 inches in diameter, to 37 ft BLSD. There will be no groundwater contact during construction or occupancy once the casing has been set for the elevator piston.

Environmental sampling conducted in March 2005 confirmed that hazardous substances are not present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. Based on the sampling results, document/data reviews, interviews, and inspections conducted, transfer of the Property and the excavation needed to construct the JIBS will be protective of human health and the environment. As a result, a property-specific risk assessment was determined to be unnecessary and, therefore, was not performed in support of this CDR.

6.1 Human Health Risk Assessment

Although a property-specific risk assessment was not performed, a general discussion of risk assessment for the area covered by the ROD for Interim Actions in Bethel Valley, which covers the Property, is provided for background information and comparison purposes. The proposed JIBS site is located adjacent to Building 1505 and across White Oak Avenue from Building 1503. First Creek serves as a border for both the Central Bethel Valley 2000 Area and West Bethel Valley, as well as a border for the proposed JIBS location. The Central Bethel Valley 2000 Area is bounded on the west by First Creek and the southern boundary dips south of White Oak Creek to include SWSA 1 and the soils in the White Oak Creek floodplain. The West Bethel Valley area encompasses about 315 acres between the western end of the ORNL main plant (First Creek) and state Highway 95 at the western boundary of the White Oak Creek watershed. Therefore, baseline human health risks associated with soil, sediment, surface water, and groundwater will be considered from both the Central Bethel Valley 2000 and West Bethel Valley areas, as applicable, to the proposed JIBS site.

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[32] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

[33] Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

[34] USDOE, *Proposed Plan for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*. DOE/OR/01-1795&D3. Oak Ridge, TN.

In the RI/FS, which was prepared prior to the ROD for Interim Actions in Bethel Valley, three human health exposure scenarios were evaluated for the Bethel Valley area in the baseline HHRA. These were the industrial, recreational, and residential future land use exposure scenarios. These scenarios were evaluated at all Oak Ridge sites and reflect the consensus among the decision makers about what land use scenarios should be evaluated in a baseline risk assessment. Residential land use was evaluated as a potential receptor for the RI/FS in order to provide a bounding scenario.

Summarized in Table 2 are the baseline HHRA industrial worker scenario, recreational use, and residential use scenario estimated risks described in the RI/FS for the Bethel Valley Watershed Area (Central Bethel Valley 2000 and West Bethel Valley areas), which contains and is adjacent to the proposed building site. The EPA has established target risk ranges for the industrial, recreational, and residential use scenarios in Bethel Valley. The EPA target risk levels for carcinogens range from 1 E-6 to 1 E-4 and for noncarcinogens. Hazard Indices should be less than 1.

Table 2. Human Health Risk Assessment Results for Properties Adjacent to the Proposed JIBS Site

Location/ Exposure Media	Industrial Use Scenario		Recreational Use Scenario		Residential Use Scenario	
	Cancer Risk[1]	Noncancer Hazard[2]	Cancer Risk	Noncancer Hazard	Cancer Risk	Noncancer Hazard
Central Bethel Valley 2000 Area						
Soil	<1E-4	< 1	<1E-6	< 1	1.4E-4 to 7.2E-1	> 1
Sediment	2.2E-5; 6.4E-4	1.5; <1	<1E-4	<1	7E-4 to 1.3E-1	> 1
Surface Water	1.4E-4 to 4.4E-4	<1	<1E-4	<1	9.9E-6 to 2.1E-3	1.9; 8; < 1
Groundwater	1.6E-5 to 1.4E-3	> 1	8.4E-9 to 1E-3	1.2; 1.3; < 1	2.6E-6 to 4.1E-1	> 1
West Bethel Valley						
Soil	1.5E-5 to 2.4E-1	< 1	6.6E-7 to 1.2E-2	< 1	3.9E-4 to 8E-1	> 1
Groundwater	1.9E-6; 2.6E-5	< 1 ; 3.6	<1E-6	< 1 ; 11	1.8E-5; 1.3E-4	> 1

1. The target carcinogenic risk range according to EPA is 1E-6 to 1E-4.
2. The target noncarcinogenic hazard is equivalent to a Hazard Index value of less than 1.

The primary contaminant sources in the Central Bethel Valley 2000 Area include SWSA 1, an inactive liquid low-level waste (LLLW) tank, active and inactive LLLW and process liquid waste drain pipelines, four LLLW line leak sites and associated contaminated soil, contaminated soil along a portion of the White Oak Creek floodplain, the western extension of the Core Hole 8 plume, and a reported area of mercury-contaminated soil, all of which lie opposite First Creek from the Property. The western extension of the Core Hole 8 plume is the closest contaminant source in the Central Bethel Valley 2000 Area to the Property (approximately 210 ft to the northeast); however, most of the Central Bethel Valley 2000 Area contaminant sources are within

a 0.25 mile radius of the Property. A series of interceptor trenches on the east side of First Creek collects contaminated groundwater from the Core Hole 8 plume.

Contaminant sources in the West Bethel Valley Area include SWSA 3, the CMSA, the Contractor's Landfill, and the West End Dump Site. With the exception of the approximately 8 ft by 10 ft West End Dump Site located just under 0.25 mi from the Property, the other disposal areas are located greater than 0.5 mi from the Property. The shallow groundwater and surface water flow direction in the West Bethel Valley Area is from these disposal areas to the southeast toward the Northwest Tributary and not toward the Property.

There were seventy-six soil sample locations in the Central Bethel Valley 2000 Area. Risks were calculated on an aggregate and individual sample basis. The aggregate risk for the industrial scenario for Central Bethel Valley 2000 soils was 5.5E-3. However, as shown in Table 2, the carcinogenic risk result for the industrial use scenario for soil was less than 1E-4 at the First Creek sampling location SB106 (see Figure 2), which is adjacent to the proposed JIBS site. The Hazard Index (HI) for all of the Central Bethel Valley 2000 Area soil locations was less than 1 for the industrial scenario. There were 21 soil sample locations in the West Bethel Valley; of these, there were six surface soil sample locations along First Creek, which are south of the proposed JIBS site. As shown in Table 2, the carcinogenic risk result for the industrial use scenario for soil locations at First Creek (West Bethel Valley) ranged from 1.5E-5 to 2.4E-4. The HI for all of the West Bethel Valley area soil locations was less than 1 for the industrial scenario.

Nine sediment stations were sampled in the Central Bethel Valley 2000 Area. The upstream First Creek location, CS010 (see Figure 2), was the only location that showed a Hazard Index greater than 1 for the industrial scenario (p. 5-133), but the carcinogenic risk was less than 1E-4. This elevated hazard was due to Aroclor-1254. The downstream First Creek location, CS011 (see Figure 2), did not show any detects for PCBs or any detects for noncarcinogenic contaminants, but did result in a carcinogenic risk greater than 1E-4. In the West Bethel Valley area, sediment sampling locations were on Northwest Tributary, which are not located near the proposed property transfer parcel.

There were twenty-eight in-stream surface water sampling locations in the 2000 Area of Central Bethel Valley. These locations were in the reaches of First Creek and White Oak Creek.

The sampling locations that represent surface water conditions on First Creek were the SW-7, CS011, First Creek sampling station, and FC-1 (see Figure 2). As shown in Table 2, the carcinogenic risk result for the industrial use scenario for these surface water sampling locations ranged from 1.4E-4 to 4.4E-4 and the Hazard Indices were less than 1. First Creek receives the discharge for the Core Hole 8 plume, suspected of being the leading source of Sr-90 and uranium isotopes in the creek. Contaminant discharges from First Creek have been improved by installation of a groundwater interception trench to mitigate discharge from the Core Hole 8 plume. In the West Bethel Valley Area surface water sampling locations were along the Northwest Tributary, which are not located near the proposed land parcel.

There were 38 groundwater sampling locations in the Central Bethel Valley 2000 Area, of these there were four groundwater sampling locations (811, 540, 4008, and 809; see Figure 3) east of the proposed JIBS area. As shown in Table 2, the carcinogenic risk result for the industrial use scenario for these groundwater sampling locations ranged from 1.6E-5 to 1.4E-3 (Arsenic). The noncarcinogenic Hazard Indices were greater than 1 (arsenic). In the West Bethel Valley Area there are two groundwater sampling locations between 30 and 170 feet east of the proposed JIBS site (Wells 536 and 810). As shown in Table 2, the carcinogenic risk result for the industrial use scenario for these ground water sampling locations ranged from 1.9E-6 to 2.6E-5. The Hazard

Index was > 1 (antimony) for the industrial scenario at one of the sampling locations (Well 536), but was less than one for the other sampling location (Well 810).

6.2. Ecological Risk Assessment

A Baseline Ecological Risk Assessment (BERA) was conducted for the Bethel Valley Watershed RI/FS. The BERA presents an analysis of the risks to various ecological receptors in the Bethel Valley area. The BERA was organized in terms of the standard EPA framework[35] and follows the strategy and guidelines developed for ORR assessments.[36,37] Representative receptors from the aquatic and terrestrial ecosystem were selected, along with appropriate assessment and measurement endpoints. The aquatic organisms include the fish community, benthic invertebrate community, and piscivorous wildlife. Terrestrial organisms include piscivorous and terrestrial wildlife species and the terrestrial plant community.

Ecological risks associated with First Creek and associated areas are summarized below.

- Central Bethel Valley 2000 Area: Terrestrial habitats within this industrialized area are not considered significant for populations of ecological receptors and were not addressed quantitatively in the RI/FS. For First Creek, impacts on fish and benthic invertebrates communities are evident. A number of chemicals exceeded probable effects-level benchmarks in First Creek, including aluminum, cadmium, chromium, iron, and silver (p. 5-148). However, aluminum is unlikely to be toxic in this system, and these metals are potentially associated with the particulate fraction of the water samples. Therefore, the reported concentrations may overstate their bioavailability. In addition, standard toxicity tests indicated no acute or chronic toxicity. No risks were identified for aquatic organisms or piscivorous wildlife exposed to radionuclides in surface water and sediment.

- West Bethel Valley: No anticipated radiological impacts from surface soils to terrestrial populations located in West Bethel Valley near the proposed JIBS site. At two locations FC-11 and FC-12 (see Figure 2), boron and silver appear to be the primary analytes and locations of concern, respectively (p. 5-81). However, none of these should present population ecological risks. No risks were identified for aquatic organisms or piscivorous wildlife exposed to radionuclides in surface water or sediment in West Bethel Valley.

6.3 Risk Analysis Summary

As discussed in Section 6.0, the ROD for Interim Actions in Bethel Valley found the Property to be suitable for unrestricted industrial use with respect to soil excavation or disturbance to a depth of 3 m (10 ft). The only exception to the designated land use controls required for JIBS will be for installation of an elevator piston approximately 12 inches in diameter to approximately 37 ft BLSD. Environmental sampling conducted in March 2005 confirmed that hazardous substances are not present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. Based on the sampling results, document/data reviews, interviews, and inspections conducted, transfer of the Property and the

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35 U.S. Environmental Protection Agency. *Framework for Ecological Risk Assessment,* EPA/630/R-92/001, 1992.

36 Suter, G. W., Sample, B. E., Jones, D. S., and Ashwood, T. L. *Approach and Strategy for Performing Ecological Risk Assessments for the U.S. Department of Energy's Oak Ridge Reservation: 1995 Revision,* ES/ER/TM-33/R2. Lockheed Martin Energy Systems, Oak Ridge, TN, 1995.

37 Suter, G. W. *Risk Characterization for Ecological Risk Assessment of Contaminated Sites,* ES/ER/TM-200, Lockheed Martin Energy Systems, Oak Ridge, TN, 1996.

excavation needed to construct the JIBS will be protective of human health and the environment. Therefore, a property-specific risk assessment was not performed.

Although a groundwater risk assessment for the Property has not been performed, the only potential contact with groundwater will be during construction of the elevator piston required for JIBS. There will be no further groundwater contact during construction or occupancy once the casing has been set for the elevator piston. The deed contains restrictions prohibiting the withdrawal of the groundwater under the Property, thereby eliminating any potential exposure pathway to groundwater other than the temporary, construction-related, direct contact and ensuring transfer of the Property is safe for the intended use.

7.0 Response/Corrective Action and Operation and Maintenance Requirements

A ROD for Interim Actions in Bethel Valley[38] was signed in May 2002. In the ROD, the three parties to the FFA have reached consensus that no active soils clean up for the parcel proposed for transfer is required to achieve the unrestricted industrial land use. Environmental sampling conducted in March 2005 confirmed that hazardous substances are not present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property. Based on the sampling results, document/data reviews, interviews, and inspections conducted, transfer of the Property and the excavation needed to construct the JIBS will be protective of human health and the environment. Environmental monitoring information confirms that groundwater under portions of ORNL, including Central Bethel Valley (e.g., the Core Hole 8 plume), east of the Property, is contaminated due to historical activities; groundwater under the Property may also be contaminated.[39] Accordingly, the deed will contain restrictions on the extraction and use of groundwater by the Grantee. DOE will retain responsibility for any necessary future groundwater remediation on the Property. The ROD for Interim Actions in Bethel Valley[40] specifies that the Core Hole 8 plume, east of the Property, will be remediated through the installation of groundwater extraction wells and sumps with treatment of the extracted groundwater. In addition, the ORNL Excavation/Penetration Permitting Process will be followed for excavation activities on the Property. The Excavation/Penetration permit process is designed to ensure planned work activities are consistent with any CERCLA commitments/requirements.

The ROD for Interim Actions in Bethel Valley contains limited measures designed to address groundwater contamination within portions of the Bethel Valley Watershed, including the Core Hole 8 plume north/northeast of the proposed site. In order to ensure that all groundwater beneath ORNL is subject to appropriate remedial measures, an additional ROD addressing all site groundwater is scheduled for 2013. Any remedial action required on the Property by that or any other ROD will be implemented. The Groundwater ROD and any supporting characterization/documentation needs will be scheduled in Appendix J, and, eventually, Appendix E, of the FFA.

The schedule for implementation of remaining remedial requirements in the West Campus will be codified in Appendix J (Non-enforceable Projected Milestones) and, eventually, Appendix E (Timetables and Schedules) of the FFA pursuant to FFA protocols, and will be included in the deed as well.

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38 Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

39 Ibid.

40 Ibid.

8.0 Deed

This document prepared by
Cindy Hunter, Realty Officer and
Nancy Carnes, Attorney
Oak Ridge Operations Office
U.S. Department of Energy

STATE OF TENNESSEE)
) QUITCLAIM DEED
COUNTY OF ROANE)

THIS QUITCLAIM DEED, made between the UNITED STATES OF AMERICA, hereinafter referred to as the GRANTOR, acting by and through the Secretary of the Department of Energy, under and pursuant to the powers and authority contained in Section 161g of the Atomic Energy Act of 1954; as amended (42 U.S.C. § 2011 et seq.) and the State of Tennessee, hereinafter referred to as GRANTEE. The GRANTOR and GRANTEE have agreed that in order to assure enforceability of land use restrictions, this Quitclaim Deed shall serve as a Notice of Land Use Restrictions pursuant to Tennessee Code Annotated § 68-212-225, having all the effectiveness and enforceability of such Notice.

-WITNESSETH –

THAT THE GRANTOR, for good and valuable consideration, by these presents does hereby remise, release, and quitclaim to the GRANTEE, its successors and assigns, subject to the exceptions, reservations, restrictions, covenants, and conditions hereinafter expressed and set forth, all the right, title, interest, claim or demand which the GRANTOR has or may have had in or to the following described property which is situated, lying and being in the State of Tennessee, County of Roane, to wit:

All that parcel of land located in Roane County, Tennessee, as shown on a map dated July 2005 prepared by Barge, Waggoner, Sumner & Cannon, Inc. which is attached as Exhibit "A-1" and titled *Department of Energy, Oak Ridge Reservation, TN, Conveyance of Parcel of Land, JIBS West Site*. Said parcel is more particularly described as follows:

Beginning at a point located at Tennessee Grid Coordinate North = 583,131.01 East = 2,465,624.18 said point marks the southeast corner of the JIBS property;

Thence continuing with said property line South 55 deg. 13 min. 11 sec. West, 77.34 feet to a point;

Thence North 34 deg. 46 min. 49 sec. West, 32.00 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 6.66 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 31.00 feet to a point;
Thence South 55 deg. 13 min. 11 sec. West, 10.00 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 23.34 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 9.00 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 147.32 feet to a point;
Thence South 55 deg. 13 min. 11 sec. West, 11.10 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 41.99 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 38.10 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 10.67 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 52.83 feet to a point;
Thence South 34 deg. 46 min. 49 sec. East, 74.00 feet to a point;
Thence South 55 deg. 13 min. 11 sec. West, 13.84 feet to a point;
Thence South 34 deg. 46 min. 49 sec. East, 125.99 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 13.00 feet to a point;
Thence South 34 deg. 46 min. 49 sec. East, 23.34 feet to a point;
Thence South 55 deg. 13 min. 11 sec. West, 14.00 feet to a point;
Thence South 34 deg. 46 min. 49 sec. East, 30.96 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 6.69 feet to a point;
Thence South 34 deg. 46 min. 49 sec. East, 32.04 feet to the point of beginning

NOTE: All coordinates, distances and bearings are based on the TN State Plane Coordinate System NAD 83 (**). (88) refers to the year in which Martin Marietta Energy Systems (MMES) established GPS Monuments on the Oak Ridge Reservation using values published in 1986 by the TN Department of Transportation which tied the MMES GPS monuments to the Tennessee Geodetic Reference Network System.

This conveyance is made subject to the following covenants, restrictions, reservations, easements and conditions:

(1). All reservations and easements, including but not limited to, existing easements for public roads and highways, railroads, transmission lines, pipelines, and other public utilities.

(2). Reserving to the GRANTOR, the continuing rights to use GRANTOR's existing utility systems in such a manner as not to create any unreasonable interference with the use of the land for the purposes for which herein granted.

(3). Covenanting to the GRANTOR, the promissory right and easement on the part of the GRANTEE, insofar as legally empowered, to permit the GRANTOR to construct, use, and maintain necessary communication, utility, or access facilities across, over, and/or under existing easements, cited in Condition No. (1) herein, lying within the parcel, in such manner as not to create any unreasonable interference with the use of the land herein granted.

(4). All construction within any 100-year floodplain and all construction within any floodway must comply with applicable Federal and State laws with respect to said construction.

(5). If any portion of the land herein conveyed is deemed to be jurisdictional wetlands as determined by the Nashville District Corps of Engineers, any development thereon must comply with the Department of Army Wetlands Construction Restrictions contained in 33 CFR, Sections 320 through 330, as amended, and any other applicable Federal, State, or local wetlands regulations.

(6).The land herein conveyed shall be used in a manner consistent with the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.).

(7).The acknowledged consideration for this conveyance is the intended benefit to be derived by the GRANTOR for facilities to be developed and partially utilized by the GRANTOR's prime contractor to accomplish GRANTOR-assigned mission activities in support of the Atomic Energy Act of 1954, as amended.

(8). The property herein conveyed shall be used by the GRANTEE for purposes consistent with and in furtherance of the Atomic Energy Act of 1954. In the event the GRANTEE does not utilize the land in a manner consistent with the anticipated use cited above within a period of two (2) years from the effective date of this conveyance, the land and all interests thereto, are subject to the reversionary rights by the GRANTOR as set forth in Condition No. 16 cited herein. In the event developmental activities are begun and subsequently halted by the GRANTEE or its successors, representatives, agents, or assigns for a period exceeding one (1) year, the land and all facilities located thereon, are subject to the reversionary rights by the GRANTOR pursuant to Condition No. 16 below. However, if the reversionary provisions are effected, the GRANTOR will give the GRANTEE one-hundred and twenty days' (120) written notice of breach of the condition(s) to enable the GRANTEE the opportunity to perform curative action to meet the terms and intent for which this land is being conveyed.

(9). The GRANTOR agrees to grant a separate easement to the GRANTEE over Federal land under the GRANTOR's jurisdictional control that will accommodate appropriate utilities and construction laydown area for any developmental activities undertaken by the GRANTEE in carrying out

Atomic Energy Act mission activities. Utilities shall be provided by the GRANTOR. Further, during the GRANTEE's use of the premises for Atomic Energy Act mission activities, the GRANTOR will issue a license to the GRANTEE for an agreed-on number of parking spaces for use with any facilities constructed by the GRANTEE on the premises. In the event the GRANTOR elects not to repurchase said land and facilities and the provisions of Condition No. 13 are invoked, the GRANTOR will grant by separate easement or other conveyance document, necessary parking rights to the recognized owner of the land and facilities in order to serve the occupants of the facilities.

(10). The GRANTOR reserves to itself on behalf of the Government, its agents, representatives, and assignees, the prior right to repurchase all or any part of said premises and property herein conveyed along with any improvements constructed on the premises subsequent to the date of this conveyance. At the end of a term concurred in by the GRANTOR and not to exceed twenty-five (25) years, the GRANTEE agrees to offer the GRANTOR said repurchase rights to the property conveyed with this Quitclaim Deed at the end of said agreed-on term and, if the GRANTOR elects to exercise its repurchase rights, GRANTEE agrees to pursue all reasonable means to effect reconveyance to the GRANTOR within one-hundred and twenty (120) days from the GRANTEE's date of the offer of repurchase. Should repurchase occur, the cost for said repurchase shall be at a nominal consideration. If said repurchase is declined by the GRANTOR and title remains vested in the name of the GRANTEE, the GRANTEE's rights remain subject to the use restrictions contained in Condition No. 14 of this Quitclaim Deed and to the GRANTOR's option for reversionary rights contained in Condition No. 16 of this Quitclaim Deed.

(11). In the event the GRANTOR elects to repurchase the land and facilities as provided for in Condition No. 10, GRANTOR agrees to permit the GRANTEE to continue its occupancy in all or a portion of the facilities at no rental costs to the GRANTEE for a period of twenty (20) years providing that the use of the facilities will continue to be for the mutual benefit for the GRANTOR and GRANTEE. Determination of the amount of space and use of the facilities will be addressed within a

three-party Memorandum of Understanding between the Grantor, the GRANTOR's contractor, and the GRANTEE defining the terms.

(12). The GRANTEE may not further convey title to any portion of this land to another party unless the provisions of Conditions Nos. 13, 14, and 16 are invoked and included in the transfer instruments, including deeds. The GRANTOR's contractor shall approve the design and specifications for all improvements to be constructed on the land contained within this Quitclaim Deed.

(13). In the event the GRANTOR elects not to repurchase said land and facilities as set forth in Condition No. 10 cited herein, title to the land and facilities, which shall be vested in the GRANTEE pursuant to same Condition No. 10, shall remain with the GRANTEE and the restrictions or provisions set forth in Condition Nos. 8 and 10 shall no longer apply to the property herein conveyed.

(14). The GRANTOR acknowledges that the Oak Ridge Reservation has been identified as a National Priorities List Site under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended. The GRANTEE acknowledges that the GRANTOR has provided it with a copy of the Oak Ridge Reservation Federal Facility Agreement (FFA) effective on January 1, 1992, and relevant amendments entered into by the GRANTOR, Region 4 of the United States Environmental Protection Agency, and the Tennessee Department of Environment and Conservation. The GRANTEE agrees that should any conflict arise between the terms of such agreement as it presently exists or may be amended and the terms of this Quitclaim Deed, the terms of the FFA will take precedence.

A. GRANTOR warrants that any additional response action found to be necessary after the date of transfer for contamination on the property existing prior to the date of this transfer will be conducted by the United States. This warranty will not apply in any case in which any GRANTEE of the property is a potentially responsible party with respect to the property before the date on which GRANTOR transferred the property. The obligation of the United States under this warranty will be limited to the extent that a response action is required by an act or omission of any GRANTEE which either (a) introduces new contamination or (b) increases the cost or scope of the required response action by negligently managing any contamination present on the property at the time of the initial transfer by the United States.

B. GRANTOR reserves a right of access to all portions of the property for environmental investigation, sampling, remediation or other corrective action. In the event the GRANTOR must access the property, the GRANTOR must provide notice to and coordinate access with the GRANTEE and any authorized occupants of the property. Any such entry, including such activities, responses or remedial actions, shall

be coordinated with the GRANTEE and shall be performed in a manner which minimizes, to the extent practicable, interruption with GRANTEE's activities on the property. GRANTOR's right to access the property shall be exercisable in any case in which a remedial action, response action or corrective action is found to be necessary by the applicable regulatory authority after the date of conveyance of the property, or in which the applicable regulatory authority determines access is necessary to carry out a remedial action, response action, or corrective action on adjoining property. Pursuant to this reservation, the United States and its officers, agents, employees, contractors and subcontractors shall have the right (upon reasonable notice to and coordination with the GRANTEE and any authorized occupant of the property) to enter upon the property and (1) conduct investigations and surveys, including but not limited to drilling, test-pitting, borings, data and record compilation, and other activities related to environmental investigation and (2) to carry out any other response and/or corrective actions as required or necessary under CERCLA and other applicable authorities, including but not limited to installation and operation of monitoring wells and pumping wells, and conducting treatment required under CERLCA and other applicable authorities.

C. GRANTEE covenants that it will not inhibit or hinder the GRANTOR from required remedial investigations, response actions, or oversight activities including, but not limited to, properly constructing, upgrading, operating, maintaining and monitoring any groundwater treatment facilities or groundwater monitoring on the property or adjoining property.

D. GRANTOR shall submit on an annual basis, through established channels, appropriate budget requests to the Director of the Office of Management and Budget that adequately address those agreed-upon schedules for investigation and completion of all necessary response actions required by the FFA. The actual amount available for such activities is subject to Congressional authorizations and appropriations.

E. When all response actions necessary to protect human health and the environment with respect to any substance remaining on the property on the date of transfer have been taken, the United States shall execute and deliver to the transferee an appropriate document containing a warranty that all such response actions have been taken.

F. The GRANTEE covenants and agrees that it shall not construct or permit to be constructed any well, and shall not extract, utilize, consume or permit to be extracted, any water from the aquifer below the surface of the ground within the boundary of the Property for the purpose of human consumption, or other use, unless such groundwater has been tested and found to meet applicable standards for human consumption, or such other use, and such GRANTEE or occupant shall first have obtained prior written approval of the GRANTOR and the applicable regulatory authorities including, but not limited to, the regulator parties to the FFA. The costs associated with obtaining use of such water, including but not limited to the costs of permits, studies, analysis, or remediation, shall be the sole responsibility of the GRANTEE without any cost whatsoever to the GRANTOR.

G. GRANTEE covenants and agrees that it will not at any time cause or allow any excavation, use, or disturbance of any portion of the Property located more than 40 feet below ground surface within Section A or located more than 10 feet below ground surface within Section B without prior written approval from the GRANTOR, the EPA, and TDEC.

H. GRANTEE covenants that it will not at any time cause or allow any portion of the property to be used for any residential housing, any elementary or secondary school, any child care facility or children's playground, or any recreational use.

I. After notice and coordination with the GRANTEE as set forth in paragraph B. above, any response actions taken by the GRANTOR will be in accordance with schedules developed and included in

Appendix E and/or J of the FFA. GRANTOR will take all necessary response action required on the property. The following milestones, which are subject to modification by agreement of the FFA parties for CERCLA response actions in Bethel Valley are reflected in Appendix E and/or Appendix J of the FFA:

Bethel Valley Groundwater Remedial Investigation/Feasibility Study, 2012
Bethel Valley Groundwater Record of Decision (ROD), 2013
Bethel Valley ROD Remedial Action Report, 2013
Bethel Valley Groundwater ROD Remedial Action Report, 2018

(15). It is expressly understood that Bethel Valley Road which is adjacent to the property herein conveyed is an ingress/egress right-of-way under the jurisdictional control of the GRANTOR. As such, the GRANTEE shall comply with GRANTOR-mandated requirements regarding usage of that right-of-way.

(16). In the event of a breach of any portion of Condition Nos. 8, 10, 12, or 14 set forth above, whether caused by legal or other inability or failure of GRANTEE, its successors and assigns, to perform any of the obligations herein set forth, all right, title, and interest in the land and improvements under the existing ownership that is affected by the breach shall, at the option of the Government, revert to and vest in the United States of America, which shall have an immediate right-of-entry thereon, and the GRANTEE, its successors or assigns, shall forfeit all right, title, and interest in and to the above described property and in any and all of the hereditaments, and appurtenances thereto.

(17). GRANTEE, upon observing the covenants and conditions imposed in this Quitclaim Deed, may peaceably and quietly possess and enjoy the property free from any interference or disturbance other than as set forth in those covenants and commitments by the GRANTOR. Should any future action by the GRANTOR, specifically including any actions taken pursuant to the covenants and commitments set forth in this Quitclaim Deed, substantially interfere with the GRANTEE's quiet use and enjoyment of the property, the GRANTEE may seek recourse against the GRANTOR for any actual loss which such parties establish they have sustained solely as a result of the actions of the GRANTOR, including but not limited to (a) additional construction costs actually incurred as a result of construction delays, demobilization and remobilization, (b) additional interest costs incurred during any delay in construction resulting from such actions, (c) the reasonable expenses of moving or relocating tenants, and (d) the

additional rent expense incurred in connection with alternative space. This covenant shall not be construed to provide a basis for any claims to compensation by such parties arising out of the actions of any entity other than the GRANTOR.

(18). By acceptance of this Quitclaim Deed or any rights hereunder, the GRANTEE, for itself, its successor and assigns forever, agrees that transfer of the property transferred by this Quitclaim Deed is accepted subject to all the terms, obligations, restrictions, reservations, covenants and conditions set forth in the Quitclaim Deed, and that these terms, obligations, restrictions, reservations, covenants and conditions shall run with the land.

TO HAVE AND TO HOLD the above described premises, subject to the exceptions, reservations, restrictions, covenants, and conditions herein set forth unto the GRANTEE forever.

IN WITNESS WHEREOF, the GRANTOR has caused these presents to be executed this _____day of _____, 2005.

UNITED STATES OF AMERICA

BY: _____
(Certified Realty Specialist)

TITLE: Realty Officer_____

Signed and sealed in the presence of:

_____

_____
Notary Public

My commission expires:

_____

STATE OF TENNESSEE)
)
COUNTY OF ROANE)

Personally appeared before me, _____, a Notary Public of the State and County aforesaid, _____, with whom I am personally acquainted, and who acknowledged that he/she executed the within instrument for the purposes therein contained, and who further acknowledged that he/she is the Realty Officer of the U.S. Department of Energy and is authorized as a representative of the U.S, Department of Energy, to execute this instrument on behalf of the United States of America.

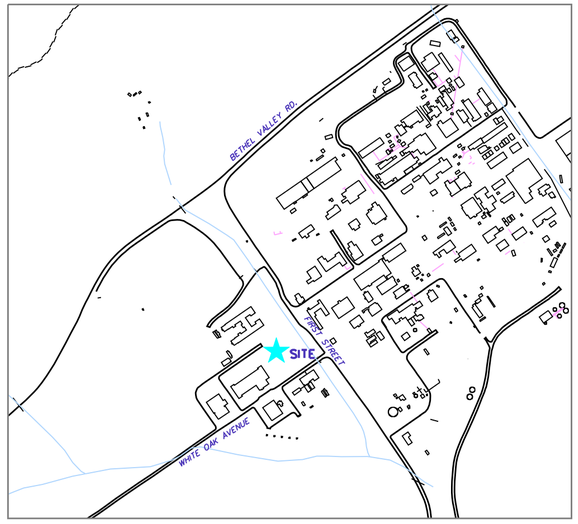
Witness my hand, at office, this _____day of _____, 2005.

_____
(Notary's Signature)

Sworn to and subscribed before me this
_____ day of _____, 2005.

_____
Notary Public, Tennessee

My Commission Expires:



VICINITY MAP

1. EXCAVATION SECTION "A" : The Elevator Piston is located at Tennessee State Plane Coordinates N-583,280.2, E-2,465,471.1. Excavation for the Piston will be lower than 10 feet but less than 40 feet. The radius of the Piston will be 0.625 feet.

2. EXCAVATION SECTION "B" : Includes all the area within the Property Boundary except Section "A" above. Excavation will not exceed 10 feet in section "B".

NORTH BASED ON TN STATE PLANE COORDINATE SYSTEM NAD 83 (88) SEE NOTE 1

N

40 20 0 20 40

SCALE: 1" = 40'

NOTES:

1. ALL COORDINATES, DISTANCES AND BEARINGS ARE BASED ON THE TN STATE PLANE COORDINATE SYSTEM NAD 83 (88). (88) REFERS TO THE YEAR IN WHICH MARTIN MARIETTA ENERGY SYSTEM (MMES) ESTABLISHED GPS MONUMENTS ON THE OAK RIDGE RESERVATION USING VALUES PUBLISHED IN 1986 BY THE TN DEPT OF TRANSPORTATION WHICH TIED THE MMES GPS MONUMENTS TO THE TN GEODETIC REFERENCE NETWORK SYSTEM.

Certificate of Survey

I Hereby certify that this is a category_____ survey and the ratio of precision of the unadjusted survey is 1:_____ as shown hereon. This survey has been prepared in accordance with The Standards of Practice for Land Surveys in the State of Tennessee.

_____ Tenn. Reg. No. _____

Date: _____

PREPARED BY:
BARGE, WAGGONER, SUMNER & CANNON
SUITE 500 1009 COMMERCE PARK DR.
OAK RIDGE, TENNESSEE 37830
PHONE: (865) 481-0496
JOB: 31897-07

DEPARTMENT OF ENERGY
OAK RIDGE RESERVATION, TN
CONVEYANCE OF PARCEL OF LAND
JIBS WEST SITE

DATE: JULY 2005

EXHIBIT "A-1"

9.0 Responsiveness Summary

A meeting was held with EPA and TDEC on April 18, 2005, to discuss the proposed land transfer. Following this meeting, the draft CDR was completed and submitted to EPA for review. Comments were received from EPA on June 24, 2005 and July 27, 2005. This section presents responses to the comments.

Comments

1. Section 1.0. First paragraph refers to FFA as entered into in 1991, while footnote 1 gives date of 1992. Please reconcile.

Response: The FFA document is dated January 1, 1992; the text was changed as suggested.

2. Section 1.0. Page 4. The first sentence reads a bit awkwardly. Recommend revising to read: "These findings are intended to ensure that there is a sound basis for the proposed transfer and use not posing an unacceptable risk to human health or the environment." Also, please delete "statutory" from the second sentence, because CERCLA 120(h)(3)(C)(iv) does not specify only "statutory" obligations. The statutory language reads, "A deferral under this subparagraph shall not increase, diminish, or affect in any manner any rights or obligations of a Federal agency . . ."

Response: Suggested changes made.

3. Section 5.0. The last paragraph on page 27 contains a statement that DOE will "retain" the property. I think it meant to say "reacquire."

Response: Suggested change made.

4. Section 6.2. The first bullet states that a "number of chemicals exceeded probably effect-level benchmarks in First Creek . . ." but then provides no explanation why action was not necessary. Please complete the explanation.

Response: Additional explanation added.

5. Section 10.0. Recommend changing "uses" to "uses or proposes to use." Also, please add, "excavating below 3m (10'), or using the property in a manner other than industrial above 3m (10')." after "groundwater" in the last sentence.

Response: Suggested changes made.

6. Quitclaim Deed. Please provide Exhibit "A" and the description of the property [where the text says "INSERT DESCRIPTION"].

Response: Description has been added.

7. Quitclaim Deed. Paragraph (10) refers to an Addendum. This may be a relic of an earlier draft. Please clarify whether an Addendum will be used. If so,

then please provide that Addendum before EPA considers its review complete. It appears, however, that paragraph 15 (with "lettered" subparagraphs following) effect the purpose of the "Addendum," so substituting "Paragraph 15" (and other correlative grammatical changes) may suffice to supply the correct location and effect of the use restrictions and other covenants. Please clarify.

Response: The reference to an addendum has been deleted.

8. Quitclaim Deed. Paragraph (13) refers to Condition (14), but I think that it intends to refer to Condition/Paragraph (15). Please clarify both whether the number change is correct and whether "Condition" is synonymous with my use of "Paragraph."

Response: The reference to Condition 14 is correct; however, an additional reference to Condition 15 has been added.

9. Quitclaim Deed. Paragraph (14). Please change "land an" to "land and."

Response: Change has been made.

10. Quitclaim Deed. Paragraph (14) states that, if the Grantor elects not to repurchase the Property, the Conditions contained in Condition 10 no longer apply. But Condition/Paragraph 10 that states that, if the Grantor elects not to repurchase the Property, the Grantees rights remain subject to the use restrictions. The text should be changed so that the use restrictions do not prematurely terminate, but rather remain with the Grantee should Grantor not repurchase the Property. I believe that merely deleting the reference in Paragraph 14 to Paragraph 10 would accomplish this without doing harm to the Deed.

Response: This has not been changed because Condition No. 10 retains the use restrictions in Condition No. 15. Condition No. 15 needs to be retained.

11. Quitclaim Deed. Paragraph (15) refers to an Addendum. This may be a relic of an earlier draft. Please clarify whether an Addendum will be used. If so, then please provide that Addendum before EPA considers its review complete.

Response: Reference to an Addendum has been deleted.

12. Quitclaim Deed. Paragraph (15)A. Please delete "it shall take" from the first sentence.

Response: Change has been made.

13. Quitclaim Deed. Paragraph (15)B. In the fourth sentence, please clarify why the "applicable regulatory authority" is referenced in the first clause (without reference to "Grantor") and "Grantor" is referenced in the second clause (without reference to "applicable regulatory authority"). If there is no intended

distinction, I would recommend making the clauses consistent, using in "Grantor and the applicable regulatory authority" in both instances.

Response: Change has been made.

14. Quitclaim Deed. Paragraph (15)E. Please change "executive" to "execute."

Response: Change has been made.

15. Quitclaim Deed. Paragraph 15(G) refers to Section A and B, with the intent of distinguishing prohibited excavation depths for each. Please provide diagrams depicting Sections A and B, or if the diagrams were already provided, please provide a citation to the page and/or figure numbers where Sections A and B are depicted.

Response: Diagram has been developed.

16. Quitclaim Deed. Paragraph 15. Please add a new "H" (and make existing "H", "I") prohibiting the use of the property for anything other than industrial. It should specifically list the prohibited uses, for instance, residential, recreational and or day care or other child-occupied facilities.

Response: A new Condition "H" has been added with the necessary restrictions. A new Condition "I" has been added.

17. Quitclaim Deed. Add a paragraph to the deed stating:

By acceptance of this Quitclaim Deed or any rights hereunder, the Grantee, for itself, its successors and assigns forever, agrees that the Property transferred by this Deed is accepted subject to the terms, obligations, restrictions, reservations, covenants and conditions set forth herein, which shall run with the land.

Response: Paragraph was added to the Quitclaim Deed as Paragraph 18.

18. EPA comment 10. EPA Comment 10 was not resolved satisfactorily. The reference in Condition 13 to Condition 12 should be deleted. The purpose of deleting the reference to Condition 12 (in Condition 13) is to eliminate any confusion about whether the use restrictions, contained in Condition 14, shall ever "not apply" or be terminated. The tenure of Condition 14 use restrictions is until the risk at the site will allow for unrestricted use and exposure. That is currently not the case. In the future, the Grantee may perform additional remediation that would obviate the need for ongoing land use restrictions, and petition the FFA parties to have the land use restrictions removed. But at the time of the transfer, there should be no confusion about whether Condition 14 should apply to future transfers. Where Condition 12 reads "Conditions No. 13 and 14 are invoked," it should be clear that this means "Conditions No. 13 and 14 are invoked and included in the transfer instruments, including deeds." Revise the text thusly should accomplish that.

Response: Change has been made.

19. We still have seen neither Exhibit A (see EPA Comment 6) to the deed nor the drawing with Sections A and B (see EPA Comment 15). Please provide.

Response: The exhibit to the deed (Exhibit "A-1") shows Sections A and B. The exhibit has been provided to EPA and is included in this document.

10.0 Transferee Response Action Assurance and Agreements

DOE does not contemplate that the Transferee will assume any response actions at the ORNL site unless the Transferee uses or proposes to use the land in a manner inconsistent with the land use restrictions contained in the ROD for Interim Actions in Bethel Valley. If this should change, DOE shall provide EPA and the State with all agreements, assurances, and other documents signed by the Transferee demonstrating that the Transferee is legally obligated to conduct the required response actions. As discussed in Section 8.0, development activities will be consistent with and will not interfere with the remedial actions selected in the ROD for Interim Actions in Bethel Valley. The use of the transferred areas will be restricted consistent with the land use assumptions and remedial actions selected under the ROD. The Transferee is prohibited from utilizing, consuming, or extracting any groundwater, excavating below 3 m (10 ft), or using the property in a manner other than industrial above 3 m (10 ft) in depth within the Property boundary.

11.0 Effect of Covenant Deferral Request

Nothing in this CDR shall be construed to alter DOE's or any PRP's obligation to complete necessary response actions at the ORNL site as required by CERCLA and the NCP. In accordance with CERCLA §120(h)(3)(B), this covenant deferral request pertains solely to the transfer of this Property or any portion thereof to a non-PRP.

Appendix A

Boundary, Survey, and Site Plan

METES & BOUNDS DESCRIPTION
JIBS WEST SITE
OAK RIDGE, TENNESSEE

Beginning at a point located at Tennessee Grid Coordinate North = 583,129.87 East = 2,465,658.22 said point marks the southeast corner of the JIBS property;

Thence continuing with said property line South 55 deg. 13 min. 11 sec. West, 130.09 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 326.67 feet to a point;
Thence North 55 deg. 13 min. 11 sec. East, 130.09 feet to a point;
Thence North 34 deg. 46 min. 49 sec. West, 326.67 feet to the point of beginning and containing 0.98 acres more or less

NOTE: All coordinates, distances and bearings are based on the TN State Plane Coordinate System NAD 93 (**). (88) refers to the year in which Martin Marietta Energy Systems (MMES) established GPS Monuments on the Oak Ridge Resevation using values published in 1986 by the TN Department of Transportation which tied the MMES GPS monuments to the Tennessee Geodetic Reference Network System.

Prepared by: Barge Waggoner Sumner and Cannon
May 20, 2005
BWSC File: 31897-07

VICINITY MAP

PROPERTY TRANSFER PLAN

NOTES:

1. ALL COORDINATES, DISTANCES AND BEARINGS ARE BASED ON THE TN STATE PLANE COORDINATE SYSTEM NAD 83 (88). (88) REFERS TO THE YEAR IN WHICH MARTIN MARIETTA ENERGY SYSTEM (MMES) ESTABLISHED GPS MONUMENTS ON THE OAK RIDGE RESERVATION USING VALUES PUBLISHED IN 1986 BY THE TN DEPT OF TRANSPORTATION WHICH TIED THE MMES GPS MONUMENTS TO THE TN GEODETIC REFERENCE NETWORK SYSTEM.

NORTH BASED ON TN STATE PLANE COORDINATE SYSTEM NAD 83 (88) SEE NOTE 2

N

20 10 0 10 20

SCALE: 1" = 20'

MARK F. WILSON
REGISTERED LAND SURVEYOR
TENNESSEE NO. 1753

Certificate of Survey

I Hereby certify that this is a category _____ survey and the ratio of precision of the unadjusted survey is 1: _____ as shown hereon. This survey has been prepared in accordance with The Standards of Practice for Land Surveys in the State of Tennessee.

_____ Tenn. Reg. No. _____

Date: _____

PREPARED BY:
BARGE, WAGGONER, SUMNER & CANNON
SUITE 500 1009 COMMERCE PARK DR.
OAK RIDGE, TENNESSEE 37830
PHONE: (865) 481-0496
JOB: 31897-07

DEPARTMENT OF ENERGY
OAK RIDGE RESERVATION, TN

JIBS WEST SITE

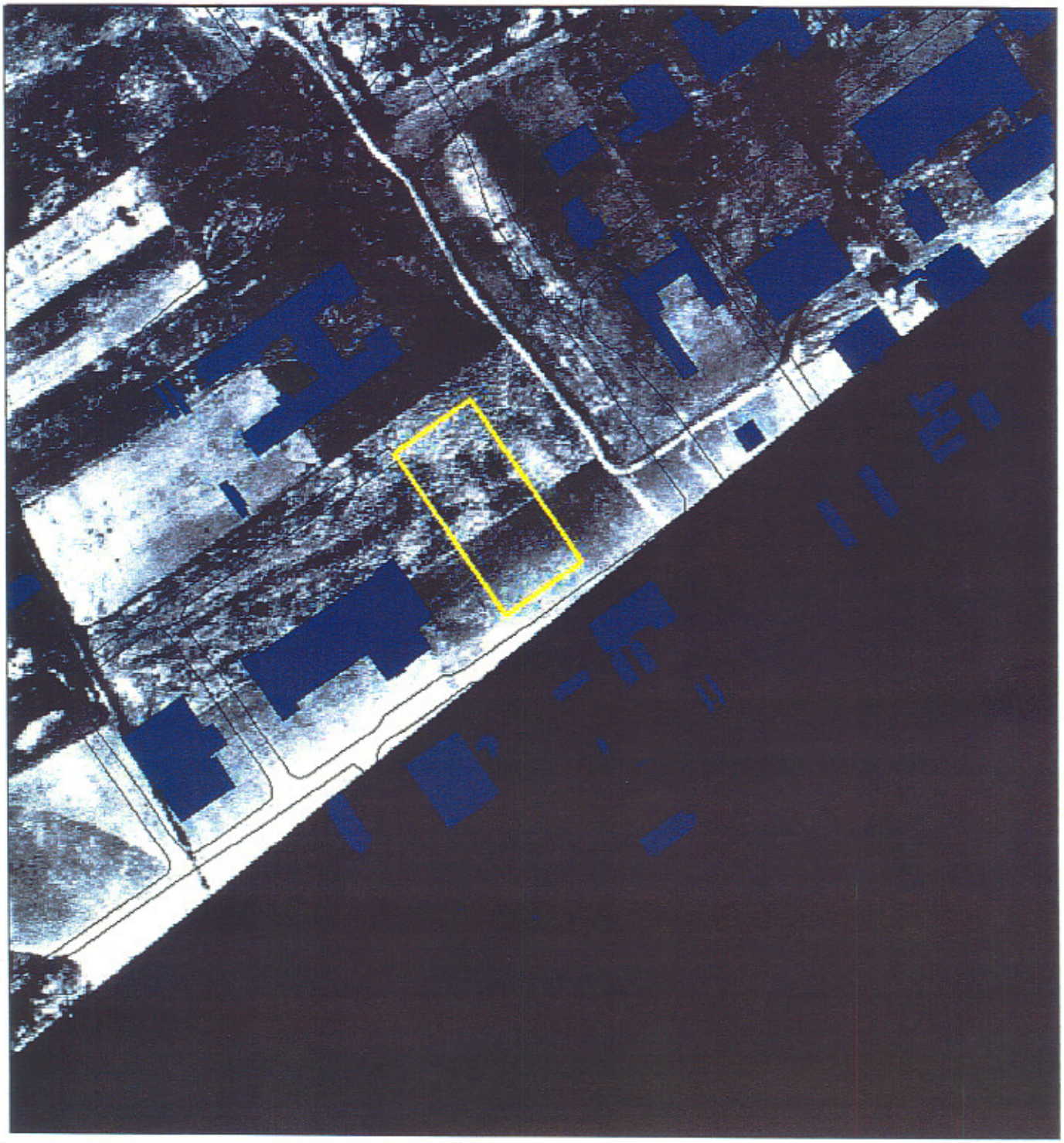
DATE: MAY 2005

EXHIBIT "A-1"

Appendix B

Aerial Photographs of ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1942 Image



LEGEND

Proposed Location of Joint Institute of Biological Sciences

Roads (c.1998)

Buildings (c. 1998)

Aerial photographs are not readily available in black area.

N

100 0 100 Meters

Prepared August 12, 2004;
1942Aerial Photograph; GIST ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1952 Image

LEGEND

- Proposed Location of Joint Institute of Biological Sciences
- Roads (c.1998)
- Buildings (c. 1998)

N

100 0 100 Meters

Prepared August 10, 2004;
1952 Aerial Photograph; GIST ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1974 Image

LEGEND

- Proposed Location of Joint Institute of Biological Sciences
- Roads (c.1998)
- Buildings (c. 1998)

N

100 0 100 Meters

Prepared August 10, 2004;
1974 Aerial Photograph; GIST ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1981 Image

LEGEND

Proposed Location of Joint Institute of Biological Sciences

Roads (c.1998)

Buildings (c. 1998)

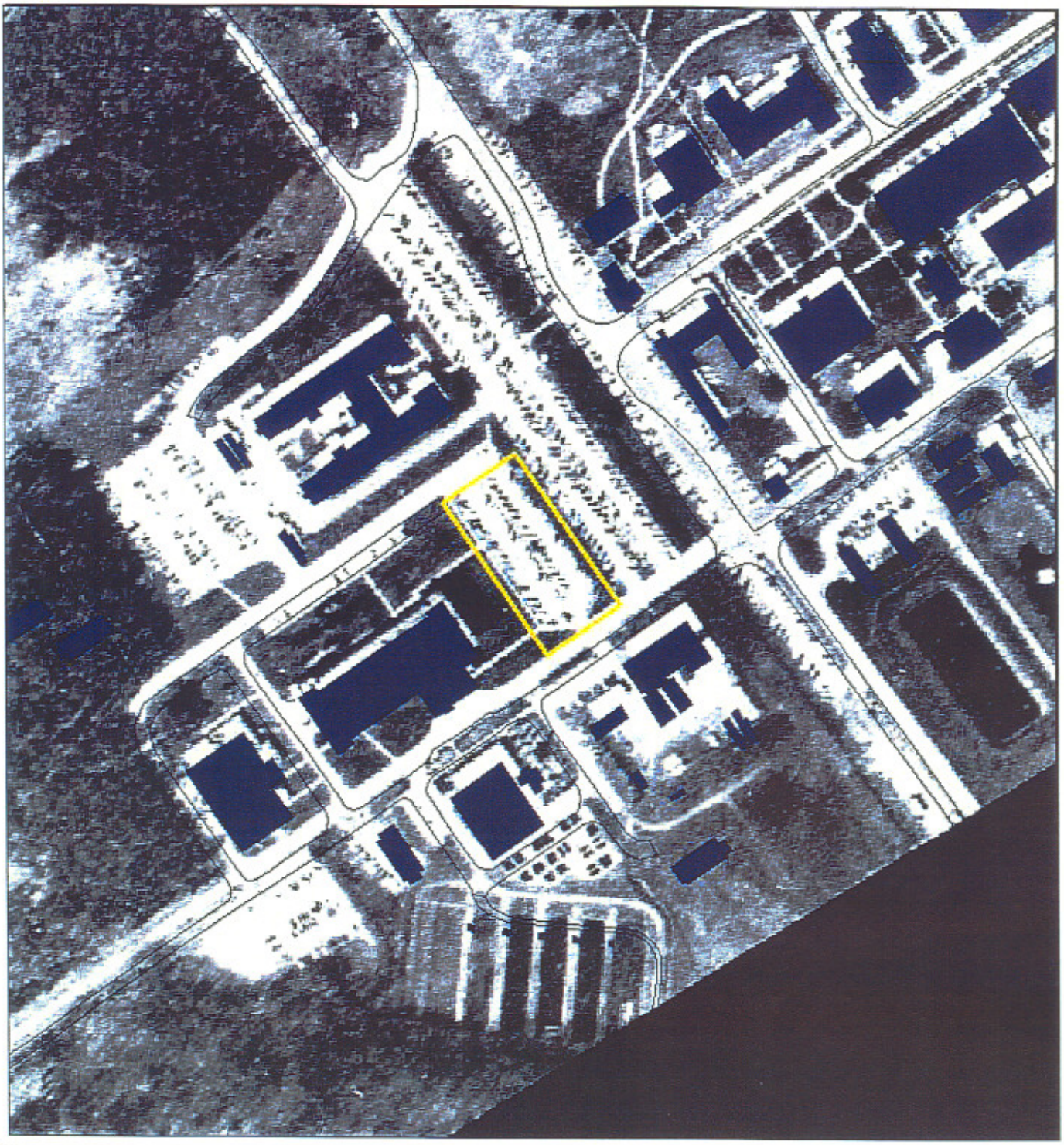
Aerial photographs are not readily available in black area.

N

100 0 100 Meters

Prepared August 10, 2004;
1981 Aerial Photograph; GIST ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1987 Image



LEGEND

- Proposed Location of Joint Institute of Biological Sciences
- Roads (c.1998)
- Buildings (c. 1998)

Aerial photographs are not readily available in black area.

N

100 0 100 Meters

Prepared August 10, 2004;
1987 Aerial Photograph; GIST ORNL

Proposed Location of Joint Institute of Biologial Sciences Facility: 1998 Image

LEGEND

- Proposed Location of Joint Institute of Biological Sciences
- Roads (c.1998)
- Buildings (c. 1998)

N

100 0 100 Meters

Prepared August 10, 2004;
1998 Aerial Photograph; GIST ORNL

Appendix C

Records Reviewed

Awl, D. J., Pounds, L.R., Rosensteel, B.A., King, A.L., and Hamlett, P.A. *Survey of Protected Vascular Plants on the Oak Ridge Reservation, Oak Ridge, Tennessee,* ES/ER/TM-194, Lockheed Martin Energy Systems, Inc., Oak Ridge, TN, June 1996.

Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee,* DOE/OR/01-1862&D4, May 2002.

Carver, M. and M. Slater. *Architectural/Historical Assessment of the ORNL,* ORNL/M-3244, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January 1994.

Coobs, J.H. and Gissel, J.R. *History of Disposal of Radioactive Wastes into the Ground at Oak Ridge National Laboratory,* ORNL/TM-10269 (formerly issued as ORNL/CF-82/202), ORNL, Oak Ridge, TN, October 1986.

DOE. *Federal Facility Agreement for the Oak Ridge Reservation,* U.S. Environmental Protection Agency, Region IV, Atlanta, GA, U.S. Department of Energy, Oak Ridge Operations, Oak Ridge, TN, and Tennessee Department of Environment and Conservation, Nashville, TN, DOE/OR-1014, January 1992.

DOE. Finding of No Significant Impact (FONSI) and Environmental Assessment for the Oak Ridge National Laboratory Facilities Revitalization Project, DOE/EA-1362, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN, June 2001.

DOE Photographic Archives of the DOE Photographer, L. Freeny

DOE Realty Office Records

DuVall, Glyn D. *An Archaeological Reconnaissance and Evaluation of the Oak Ridge National Laboratory, Oak Ridge Reservation, Anderson and Roane Counties, Tennessee,* ORNL/M-3245, January 1994.

DuVall, Glyn D. and Peter A. Souza. *An Evaluation of Previously Recorded and Inventoried Archaeological Sites on the Oak Ridge Reservation, Anderson and Roane Counties, Tennessee,* ORNL/M-4946, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January 1996.

Gunderson, C.A. et al. September 1995. *Sludge Application and Monitoring Program, 1986-1993,* ORNL/TM-11601, Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

Kingston Demolition Range Photos, Pre-1942 Home Places, Section A, Pellissippi Genealogical and Historical Society, Clinton, TN (CD available through American Museum of Science and Energy).

Kuhaida, A.J. and A.F. Parker. *Site Descriptions of Environmental Restoration Units at the ORNL,* ORNL/ER-391, Environmental Restoration Division, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tennessee, February 1997.

Lockheed Martin Energy Research Corporation. *Qualitative Change Analysis of Aerial Radiological Data of the Oak Ridge Reservation, Oak Ridge, Tennessee,* BJC/OR-106, Bechtel Jacobs Company LLC. September 1998.

Lockheed Martin Energy Systems, Inc., et al. *Environmental Restoration Footprint Reduction Process, Evaluation of Central Chestnut Ridge Study Area,* DOE/OR-01-1639&D1, Lockheed Martin Energy Systems, Inc., September 1997.

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PROPOSED TRANSFER OF PARCEL AT ORNL
FOR STATE OF TENNESSEE JOINT INSTITUTE FOR BIOLOGICAL SCIENCES BUILDING
OAK RIDGE RESERVATION, TN

FILES RESEARCH FOR HAZARDOUS SUBSTANCE ACTIVITY

The following statement is provided in support of guidance promulgated under Section 120(h) of the Comprehensive Environmental Response, Liability, and Compensation Act, as amended (CERCLA) 42 U.S.C. 9620(h) and in support of regulations issued by the Environmental Protection Agency at 40 CFR part 373.

The undersigned has made a complete search of existing and available Department of Energy (DOE) records, documentation, and data within the real estate files relating to the property that is subject to the proposed fee transfer action of a parcel of land at the Oak Ridge National Laboratory site within the Oak Ridge Reservation, Tennessee. The proposed action would result in transfer to a private entity for purposes of constructing a building for DOE's mission purposes. The search conducted was considered reasonable with a good faith effort expended to identify whether any hazardous substances were stored for one year or more, released, or disposed of on the property. The available real estate records of this office do not reflect any determinable reference that hazardous substance activity as defined by Section 101(14) of CERCLA took place on or in the property during the time the property was owned by the United States of America.

Land affected by this action is identified as a portion of original acquisition Tract A-6 in which the United States of America acquired title, (having been acquired for the Atomic Energy Commission as a forerunner of DOE) by Civil Action No. 429 filed October 6, 1942 in the United States District Court for the Eastern District of Tennessee, Northern Division. Title to Tract A-6, owned by J.H. Anderson et al, was vested in the United States of America by Declaration of Taking No. 1 filed November 20, 1942. Judgment on Declaration of Taking was filed for public record in Vol. X-5, Page 277 in the Roane County Register's Office, Tennessee.

This record shall be made a part of the CERCLA report/data currently being prepared.

Katy Kates

Katy Kates, Realty Officer
Oak Ridge Operations Office
Department of Energy
July 22, 2004

Attachment-Plat Exhibit (unsurveyed)

Appendix D

Individuals Interviewed for Information Regarding Historical and Current Hazardous Substance Activity

1. J. Hunt, Radiological Protection, July 28, 2004 – Personal communication pertaining to radiological surveys
2. J. Gray, Radiological Protection, July 29, 2004 – Personal communication pertaining to radiological surveys
3. D. Dillener, ORNL SWMU Coordinator, Environmental Protection and Waste Services (EP&WS), August 2, 2004 – Personal communication pertaining to SWMUs and AOCs
4. T. Bonine, Geological Engineer, ORNL EP&WS, Various dates from April 2004 through May 2005 – Personal communications pertaining to site walk-down results and analytical and geotechnical data
5. J. Baxter, Operations Manager for Mechanical Utilities, August 2, 2004 – Personal communication pertaining to utilities
6. S. H. Stow, Director, American Museum of Science and Energy (and erstwhile ORNL "historian"), July and August 2004 – Personal communication pertaining to early ORNL history, previous property ownership, and historical photographs
7. J. Siburt, Librarian/Historian, U.S. Army Corps of Engineers, Nashville District, April 14, 2004 – Personal communication pertaining to historical (pre-1943) records of land use
8. B. Barnes, Chief, Real Estate Branch, U.S. Army Corps of Engineers, Nashville District, April 14, 2004 - Personal communication pertaining to historical (pre-1943) records of land use
9. City of Oak Ridge, April 14, 2004 – Personal communication pertaining to historical (pre-1943) records of land use
10. M. Harris, Anderson County Historian, April 14, 2004 - Information pertaining to historical (pre-1943) records of land use
11. M. Dobrogosz, Curator of TVA Historic Collection, Tennessee Valley Authority (TVA), April 14, 2004 - Personal communication pertaining to historical (pre-1943) records of land use
12. L. Freeny, DOE Photographer, April 16, 2004 – DOE historical photographic archives and pre-1940s aerial photographs
13. E. Ryan, ORNL EP&WS, August 2, 2004 – Personal communication pertaining to spills and releases
14. K. Kates, July 22, 2004 - Communication with DOE Real Estate Office
15. E. Mulkey, ORNL EP&WS, August 23, 2004 – Personal communication pertaining to USTs

16. D. Perkins, Radiological Protection, August 23, 2004 – Personal communication pertaining to radiological surveys

17. D. Maddox, ORNL EP&WS, March 23, 2005 – Personal communication pertaining to abandoned septic tank

18. Ed Turnington, ORNL Operational Safety Services Division, April 21, 2005 and May 4, 2005 – Personal communication pertaining to radiological surface survey conducted in September 2004.

19. Bill Wolfe, ORNL Operational Safety Services Division, April 27. 2005 – Personal communication pertaining to radiological surveys of cuttings and drilling equipment from March 2005 environmental sampling at JIBS site

Appendix E

Environmental Sampling Plans for the JIBS Parcel

Joint Institute of Biological Sciences (JIBS) Project-Specific Sampling and Analysis Plan
Soil Sampling – SP2449(b)

Environmental Protection and Waste Services Division
Oak Ridge National Laboratory

UT-Battelle, LLC

Joint Institute of Biological Sciences (JIBS) Project-Specific Sampling and Analysis Plan (SAP)
Soil Sampling – SP2449

Background

Problem Statement

The Joint Institute of Biological Sciences (JIBS) facility is proposed to be constructed on a 1 acre parcel of land located approximately 100 feet east of Building 1505 in an existing parking lot. The purpose of the sampling outlined in this SAP is to perform screening-level characterization of soil between the surface and 10 feet BLSD for volatile organic compounds (VOC), metals, and radiological constituents in order to identify, and implement, required mitigating measures in support of the construction of the JIBS facility and its operations.

Project Organization

UT-Battelle Operations

The project manager (PM) for Design and Construction of the JIBS facility is Jack Stellern, Facilities and Development Division (FDD), UT-Battelle. The PM for Environmental Characterization is Lance Mezga, FDD, UT-Battelle. The PM for Field Sampling Support is Terry Bonine, UT-Battelle Environmental Protection and Waste Services Division (EPWSD) and the Special Projects Manager is Scott Fleming, EPWSD UT-Battelle. Sampling technicians are Richard Allen and J. B. Watson, EPWSD UT-Battelle. Administratively, the PM for Environmental Characterization will lead characterization efforts at the JIBS site. The Field Sampling PM and the Special Projects Manager are matrixed to the PM for Environmental Characterization, providing support. The sampling technicians report to the Field Sampling PM or Special Projects Manager during field operations. The Special Projects Manager will provide data review and verification services. Providing overall environmental compliance support is the EPWSD Environmental Protection Services Manager, David Skipper. The PM for Environmental Characterization, PM for Field Sampling Support, the Special Projects Manager, and the Environmental Protection Services Manager are all signatories to this SAP (see Section H).

DOE Operations

The DOE Oversight PM is Mark Belvin. He will provide oversight of all environmental characterization activities performed on the JIBS site. The DOE Oversight PM will provide liaison services to the DOE Environmental Management PM, Elizabeth Phillips.

Decision Approach

Analytical data generated by the SAP will be compared against established background level concentrations found in the *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Final Report on the Background Soil Characterization Project at the Oak Ridge Reservation, Oak Ridge, Tennessee, Volume 1 - Results of Field Sampling Program, October 1993*, DOE/OR/01-1175/V1, and *Final Report on the Background Soil Characterization Project at the Oak Ridge Reservation, Oak Ridge, Tennessee, Volume 2 - Data, October 1993*, DOE/OR/01-1175/V2 as well as contaminant ranges found in the *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*. Should this comparative analysis indicate the presence of contamination above levels of concern, safety measures appropriate to the risk of exposure will be employed to protect workers during the construction of the JIBS facility foundation. Any waste generated during the installation of the building foundation will be managed in accordance with appropriate waste management procedures in effect at ORNL. Moreover, Bechtel Jacobs Company representatives will be notified regarding the findings. Decisions regarding the level of personal protection and monitoring will be made by senior staff within the Operational Safety Services Division (OSSD) with input from the PM for Environmental Characterization, the EPWSD Environmental Protection Services Manager, and the Department of Energy.

Health and Safety Plan

A health and safety plan or similar document will be developed by the drilling subcontractor for drilling operations and will cover subcontractor drilling operations.[41] The health and safety document will be reviewed UT-Battelle OSSD safety personnel as well as UT-Battelle sampling technicians or others having business within established buffer or exclusion work zones.[42] Routine sampling activities performed by UT-Battelle sampling technicians will be covered by a UT-Battelle Job Hazard Evaluation (JHE) (see Section E). The JHE will be written for this project by an OSSD staff member.

Site Related Contaminants

Based on process knowledge, no known contamination exists on the JIBS site. Moreover, no known subsurface soil or groundwater sampling results exist for the area comprising the JIBS footprint. However, review of historical groundwater data[43] from the three wells closest to the JIBS site indicate minor concentrations of radionuclides were found in groundwater. The depths of these three groundwater monitoring wells (Wells 535, 536, and 810) are 15 feet, 19 feet, and 16 feet BLSD, respectively. These wells are shown on Figure 1. The historical groundwater data for these wells do not indicate the presence of volatile organics at levels of concern. Based on historical data reviewed, past usage of the parcel (and areas adjacent to the site), and prudence, soil collected per this SAP will be analyzed for VOC, metals, and radiological constituents. In particular samples will be analyzed for VOC per SW-846 Method 8260B, metals per SW-846 Method 6010b, and radiological constituents [gross activity – alpha/beta (EPA Method 900.0), and gamma emitters (EPA Method 901.1). See Section C].

A. Identifying Information

1) Project Name: JIBS Soil Sampling

2) Special Project No.: 2449

3) Material Description/Matrix: Solid (soil)

4) Number of Containers in Waste Stream: N/A

5) Material Type: Unknown – most likely clay-rich soils mixed with fill and rock fragments (Ca, Mg carbonate and shale)

6) WID Container No.: NA

7) Sampling Locations: Soil borings will be advanced into the soil column to refusal at six locations selected at random within the footprint of the JIBS parcel. The drilling equipment used to collect soil samples will consist of a cone penetrometer or hollow stem auger with discrete interval sampling capability (direct push sampling tool or split spoon sampler). See the Figure 1 in the Appendix of this SAP for boring locations in relation to the JIBS site.

B. Sampling Information

1) General: The preliminary geotechnical investigation of the JIBS footprint conducted in November 2004 revealed a relatively uniform depth to bedrock on the order of 8 to 10 feet BLSD. Soil Samples - A total of 6 soil borings will be advanced to refusal or the top of bedrock within the footprint of the proposed JIBS site. A cone penetrometer (using direct push sampling tools) or hollow stem auger (using split spoons) will be used to collect samples of soil at 5 foot intervals to auger refusal at each of the soil borings. En Core disposable samplers will be used to collect soil samples that are to be analyzed for VOC.
All samples collected under this SAP will be analyzed for radiological constituents, metals, and VOC (see Section C).

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[41] UT-Battelle sampling technicians will be covered under the drilling contractor's health and safety document when they are within the buffer and exclusion work zones during drilling operations.

[42] Anyone entering the buffer or exclusion work zones established by the drilling subcontractor may be required to sign the health and safety document signifying that the signatory has read and understood the requirements..

[43] Oak Ridge Environmental Information System.

Sampling equipment to be used during characterization efforts at the JIBS site include
a) cone penetrometer or hollow stem auger rig mounted on an all terrain vehicle – this equipment will be used to advance sampling tools to the sampling intervals of interest (nominally 5 and 10 feet BLSD, depending on refusal depth)
b) split spoon samplers or similar direct push soil sampling devices– split spoons will be used to collect soil samples over discrete depth zones of interest (5 and possibly 10 feet BLSD)
c) En Core sampling devices – En Core samplers will be used to collect soil samples earmarked for VOC analysis
d) disposable stainless steel spatulas or spoons – this equipment will be used to facilitate removal of soil from split spoons
e) sample containers appropriate to the analyses to be performed will be used to contain samples during shipment to the laboratory (See Section C)

Grab samples of soil will be collected from 5 and possibly 10 feet BLSD (depending on depth to drilling refusal/depth to rock) to characterize those zones of interest. Based on historical data reviewed and past usage of the parcel (JIBS site process knowledge), there is reasonable expectation that subsurface earth materials at the JIBS site are not contaminated. However, the level of variability or extreme concentrations in the earth materials at the JIBS site is unknown. Grab samples collected at the discrete zones outlined above should yield representative samples to confirm the absence of contaminants at levels of concern and to provide information on the variability of concentrations in earth materials sampled from the boring. Grab samples processed, analyzed, and evaluated individually normally reflect maximum variability across the intervals sampled, and thus reasonably characterize the range of contaminant concentration over the intervals sampled. Composite samples tend to "dilute" the concentrations of contaminants in the sample. Thus, for a well-formed composite, a single measured value should be similar to the mean of measurements of the individual components of the composite. Composite sampling should not be used if the integrity of the individual sample values changes because of the physical mixing of samples. The integrity of individual sample values could be affected by chemical precipitation, exsolvation, or volatilization during the pooling and mixing of samples. For example, grab sampling at discrete intervals is preferred over composite samples for VOC analysis. Therefore composite soil samples will not be collected.

2) Preservation Method: Soil samples earmarked for VOC analyses will NOT be preserved in the field by EPWSD technicians. Soil samples will be stored on ice in the field in zip-lock bags. If soil samples are not shipped on the day of sample collection, then soil samples will be shipped the next day within 24 hours of sample collection at 4 +/- 2 degrees Celsius. Once samples are received at the laboratory they must be preserved by the laboratory extruding the sample into organic-free water and frozen or analyzed within 48 hours from the time of sample collection. *All samples collected will be shipped to the laboratory via overnight express*.

3) Holding Times: There is a holding time of 6 months for ICP Metals (28 days for Hg). Radiological contaminants have a 6 month holding time. The holding time for VOC is 48 hrs from time of sample collection to preservation by the laboratory or analyzed. Soil samples will be preserved by the laboratory, therefore the holding time is extended to 14 days from the time of sample collection.

4) Sampling Technique Employed: Split spoons or direct push sampling tools will be used to bring soil samples to the surface. Grab samples of soil will be collected directly from the sampling tool used to bring the soil to the surface. Soils earmarked for VOC analyses will be collected using En Core sampling devices. Composite soil samples are not to be collected.

5) Visual Inspection Performed: N/A

6) Field Contacts: Jack Stellern, ph. 574-6434, mobile. 385-5355; Lance Mezga, ph. 574-7298, pg. 873-7767; Terry Bonine, , ph. 574-7363, pg. 873-6455; Scott Fleming, ph. 241-9673, pg. 873-5563

7) Send Analytical Results to: Scott Fleming, 4500N, D034

8) Data Deliverable: ICPT BOA standard data deliverable which includes electronic data deliverable, signed COC, case narrative, result forms, and appropriate QA/QC forms

9) Charge No.: 3EVDCL02

10) Required QA/QC Samples:

Field QA/QC	Yes	No
Trip Blank	X[44]	
Field Blank		X
Decon. Rinsate	X	
Field Duplicate		X

11) Additional Documentation of Field Activities: Field log sheets document aspects of the sample collection and handling, as well as pertinent visual observations. Per SOP-ESP-003.14, "Sample Document Control," complete the following specific information on the field log sheets during sample collection activities - project identification, location, date and time of entry, interior or exterior environment temperature, unique sample identification and description, sampling equipment used, comments, and sign offs by radiological control, OSSD, facility, and EPWSD personnel involved in collection of the samples. Chain-of-custody (CoC), sample containers, and sample identification are documented on appropriate form the CoC form and field log sheets. The CoC process is utilized to ensure the integrity of a sample from collection to delivery to an analytical laboratory. The CoC form is to be completed (per SOP-ESP-003.002 "Chain of Custody") in conjunction with the field log sheets. Specifically, the following information is to be filled out on the CoC form: sample identity, sampling data, sampling time, sample type, container type, preservative, and analytical suite requested. Additionally, the project number and laboratory are to be identified in the spaces provided on the CoC form. All sampling technicians involved in collection of the samples are to sign the CoC form twice: once in the Sampler Signature box and once in the Relinquished by box. Custody seals are to be filled out and applied to each individual sample container. Each sample container is to have an I-Chem sample label applied and this label shall be completely filled out (Client/Source, Site Name, Sample Number, Analysis, Grab/Composite Sample, Date, Time, Preservative, and initials of the sampling technician collecting the sample. Field quality control processes followed by EPWSD originate from the New Jersey Department of Environmental Protection's *NJDEP Field Sampling Procedures Manual.* New Jersey Department of Environmental Protection and U. S. Environmental Protection Agency's *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual.*

As stated above, a total of 6 boring locations will be drilled for the purpose of sampling subsurface soils. The proposed boring locations were selected randomly using a 120 element grid assigned to the area comprising the JIBS site. Nominally 2 soil samples will be collected (at five foot intervals) from each boring location – this number is based on the expectation that soil thickness at the proposed JIBS site averages approximately 8 to 10 feet BLSD. Soil slated for metals and radionuclide analyses will be sampled using clean disposable sampling stainless steel spoons, or similar implements. The soil samples slated for volatile organic analysis will collected to meet the requirements of EPA Method 5035, or equivalent guidance [e.g., Washington State Department of Ecology's *Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5* dated 22 Jun 04]. En Core 5 gm disposable samplers will be used to collect soil samples that are to be analyzed for VOC. At least 3 VOC samples for every one 5 foot interval will be collected and submitted for VOC analysis. See the Appendix for a copy of the instructions for using the En Core Sampler. Moisture content data will be obtained from the metals analysis. The laboratory must have the soil moisture content information so that it can normalize the soil VOC concentration to a dry weight basis.

As stated above, radiological constituents, metals, and volatile organics are the contaminants of concern (see Section C).

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[44] One Trip Blank per cooler (Ottawa Sand) will be included in each cooler containing soil samples for VOC. The Ottawa Sand will be provided by the laboratory to ORNL. One trip blank will be included for rinsate samples. The trip blank will be prepared by EPWSD and included with the samples shipped to the laboratory.

Related Sampling Activities

Vapor Measurements

A trained Environmental Protection and Waste Services Division (EPWSD) sampling technician will collect vapor measurements in soil at each of the boring locations using a calibrated photoionization detector (PID). The PID will be used as a screening tool only. The EPWSD sampling technician will perform screening level measurements during drilling operations as the soil is brought to the surface. A log will be used to document all measurements made with the PID. Vapor measurements will be correlated with drilling depth in the field log.

Radiological Survey Measurements

A trained Radiological Safety Services (RSS) radiological control technician (RCT) will perform radiological surveys at each of the geotechnical boring locations. Large area smears using Masslin hand wipes (smear samples) will be collected from selected areas of the drilling and ancillary equipment before and after deployment in the field. Bicron Surveyor M radiological survey instruments equipped with Geiger-Mueller (GM) beta/gamma pancake probes and A-50 ZnS alpha scintillation bear claw probes will be used to detect the presence of alpha, beta, or gamma contamination picked up by the hand wipes. The same instruments will be used in periodic "direct frisking" of the soil samples brought to the surface by the sampling tool. All radiological survey meters used will be calibrated and will meet the requirements of performance testing in accordance with ORNL SOP 02-560-01, "Control of Health Physics Instruments." Moreover, the radiological control technicians will use *Radiological Management of Excavated Soil*[45] to determine the radiological requirements for managing the disposition of the earth materials surveyed.

Hot Spot Sampling

Should PID or radiological surveys identify a "hot spot"[46] in soil, a sample will be collected from the hot spot for further testing. Vapor Screening - Should soil exceed 3X the background vapor concentration during vapor screening, an approximate 75 to 100 gm aliquot[47] of soil will be placed in a clean 250 mL wide mouth glass jar and aluminum foil securely fastened on the jar opening. The sampling jar containing the suspect soil will be tightly covered in aluminum foil to reduce the loss of volatile constituents. The jar containing the suspect soil will be placed on the dashboard of a heated vehicle (with defroster running). After 10 minutes, the jar will be removed from the vehicle (and carried upwind of vehicle exhaust) and the aluminum lid will be punctured by PID probe in order to collect a measurement. Should the measurement exceed 5X the background concentration, a sample of the suspect soil from the hot spot zone will be collected for volatile organic analysis. Radiological Screening - Radiological hot spots will be determined by project RCTs. The EPWSD sampling technicians will collect a sample from a radiological hot spot upon instruction by project RCTs.

Decontamination

Sampling tools and implements (split spoons, etc.) will be decontaminated by EPWSD personnel between each interval sampled and/or between each boring. Disposable sampling tools will be discarded and will not decontaminated. One sample of decontamination rinse water will be collected for analysis. Decontamination wastewater will be held for disposal at Duratek's on-site liquid treatment operations pending results of the decontamination rinse water analyses.

Borehole Selection

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[45] This subject area is found on ORNL's Standards-Based Management System at http://sbms.ornl.gov/sbms/sbmsearch/SubjArea/Soils/ExSoilsSA.cfm.

[46] For the purposes of this SAP a volatile hot spot will be defined as 5X volatile background or visible staining of the soil.

[47] The soil will be broken up into small pieces and quickly placed into the wide mouth sample jar and covered.

Soil samples are to be collected from 6 boring locations. The number of boring locations from which soil samples are to be collected was based on the area of the JIBS footprint and "Guidance for the Selection of the Number of Samples and Their Location" (SOP-ESP-003.082) and "Guidance for Waste Characterization Sample Design: Selection of Sample Quantity and Location" (EPWSD-QPA-TP-251). The 6 boring locations were selected using a simple random selection process.[48]

Results of Field Surveys

The results of the radiological survey and PID screening will be reported to the EPWSD Special Projects Manager and these data will be communicated to the Environmental Characterization PM.

C. Analytical Requirements

The following analyses will be performed by the Paragon Analytics, Inc (PAI) in Fort Collins, CO. The PAI contact is Ms. Julie Ellingson [(970) 490-1511] and the UT-Battelle Laboratory Liaison/Special Projects Manager is Scott Fleming [(241-9673)]. Samples will be transported to PAI via overnight delivery transporter. A 14 day turn-around-time from laboratory sample receipt to data deliverable will be required for all analyses requested in the table below.

Analyte	Method	MDA or Detection Limit	Matrix	Number of Soil Samples (not including blanks/decon. rinsate/hotspots/ etc.)
Metals	EPA SW-846 Method 6010B (ICP)	Lowest achievable	Solid	~12
Hg	EPA SW-846 Method 7471A – Solid	Lowest achievable	Solid	~12
Gross Alpha/Beta	EPA Method 900.0	Lowest achievable	Solid	~12
Gamma Spectrometry Scan	EPA Method 901.1	Lowest achievable	Solid	~12
VOC	SW-846 5035/ 8260B	Low concentration method	Solid	~12 (~36 actual 5 gm En Core samplers)

Sample mass and volume needed:

Metals (plus Hg): minimum of 250 gms
Radiological: minimum of 250 gms **(collect 2x the stated amounts for archival purposes)**
Volatile organics: 15 gms – 3 x 5 gm En Core samplers (see Appendix)
Moisture content will be derived from metals analyses and applied to other parameter results.

D. Waste Stream Distribution

Subsurface earth materials at the JIBS site are not known to contain Resource Conservation and Recovery Act (RCRA), Toxic Substance Control Act (TSCA), or radiological constituents at greater than background levels. However groundwater samples collected from wells located near the JIBS site indicate the presence of low levels of radiological constituents. Sample residuals will be disposed of by PAI. Waste earth materials and any personal protective equipment used during sampling will be containerized and held until analytical results are received from the laboratory. The analytical data will

[48] Random numbers were generated using a Hewlett Packard 42S RPN scientific calculator.

be analyzed by UT-Battelle staff and if the solid wastes are found to contain contaminant levels which exceed regulatory levels, these wastes will managed in accordance with UT-Battelle procedures and will be processed by Bechtel Jacobs Company for off-site disposal. Should the solid waste generated by the project not contain RCRA, TSCA, or radiological constituents at regulated levels, it will be sent to the Y-12 Landfill for disposal. Likewise, development and purge water will be containerized and held until results of analyses of the groundwater sampled from the temporary piezometer are obtained. A copy of the analytical results will be reviewed by the Duratek Liquid Waste Certification officer and appropriate actions will be taken to dispose of the development and purge water at one of Duratek's on-site liquid waste processing treatment units.

E. Safety Concerns

A JHE will be written for this project by an OSSD staff member. A copy of the JHE must be read and signed by all sampling technicians involved in the sampling activities. In addition, a Work Plan will be in place for this project.

As stated above, a health and safety plan, or similar document will be generated by the drilling contractor for drilling operations.

F. Data Management and Verification

Prior to initiating field sampling activities, sampling technicians will generate a unique identifier for each sample collected.

The laboratory will be requested to provide electronic data deliverables, signed field chain-of-custody forms, a case narrative, sample results, supporting quality assurance and quality control forms to support data quality.

To ensure the quality of analytical data, results will receive 100% data review and verification by the EPWSD Special Projects Manager. Data validation will not be performed on the JIBS project data. Data review and verification will be performed per the following EPWSD procedures:

Guidance for Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry and Inductively Coupled Plasma-Mass Spectrometry Data Verification and Validation (EPWSD-QPA-TP-203)

Guidance for Mercury and Metals by Atomic Absorption Data Verification and Validation (EPWSD-QPA-TP-208)

Guidance for Radiochemical Data Verification and Validation (EPWSD-QPA-TP-202)

Guidance for Volatile and Semivolatile Data Verification and Validation (EPWSD-QPA-TP-205)

G. Sampling Procedures

The following procedures will be used to collect samples per this SAP:

- *Chain of Custody*, EPWSD SOP-ESP-003-002
- *Special Projects*, EPWSD SOP-ESP-003.084
- *Sampling Document Control*, EPWSD SOP-ESP-003.014
- *Packaging Environmental and Waste Samples for Offsite Shipments*, EPWSD-EPS-TP-756 (DRAFT)
- *Utilization of MicroTIP MP-1000 for Headspace Analysis*, EPWSD SOP-ESP-003.015
- EPA Method 5035, or equivalent guidance, e.g., Washington State Department of Ecology's *Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5*), 22 Jun 04
- *Disposable En Core Sampler Sampling Procedures*, En Novative Technologies, Inc.
- *Guidance for the Selection of the Number of Samples and Their Location*, EPWSD SOP-ESP-003.082 and *Guidance for Waste Characterization Sample Design: Selection of Sample Quantity and Location*, EPWSD-QPA-TP-251
- *Sampling Equipment Decontamination*, Rev. #:0.0 – SOP#: 2006, U. S. Environmental

Protection Agency, 14 Aug. 94.

- *Guidance for Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry and Inductively Coupled Plasma-Mass Spectrometry Data Verification and Validation*, EPWSD-QPA-TP-203
- *Guidance for Mercury and Metals by Atomic Absorption Data Verification and Validation*, EPWSD-QPA-TP-208
- *Guidance for Radiochemical Data Verification and Validation*, EPWSD-QPA-TP-202
- *Guidance for Volatile and Semivolatile Data Verification and Validation*, EPWSD-QPA-TP-205

H. Signatures

Environmental Protection Services Manager
EPWSD

3/28/05
Date

Environmental Characterization Project Manager
FDD

28 MAR 05
Date

Field Sampling Support Project Manager
EPWSD

28 Mar 05
Date

Special Projects Manager
EPWSD

28 MAR 05
Date

Appendix and References

Map of Proposed JIBS Site Containing Boring Locations

Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5 dated 22 June 04. Washington State Department of Ecology. http://www.ecy.wa.gov/pubs/0409087.pdf

Disposable En Core Sampler Sampling Procedures, En Novative Technologies, Inc. http://www.ennovativetech.com/encore/sampProced1.pdf

Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. U. S. Environmental Protection Agency, November 2001. http://www.epa.gov/Region4/sesd/eisopqam/eisopqam.pdf

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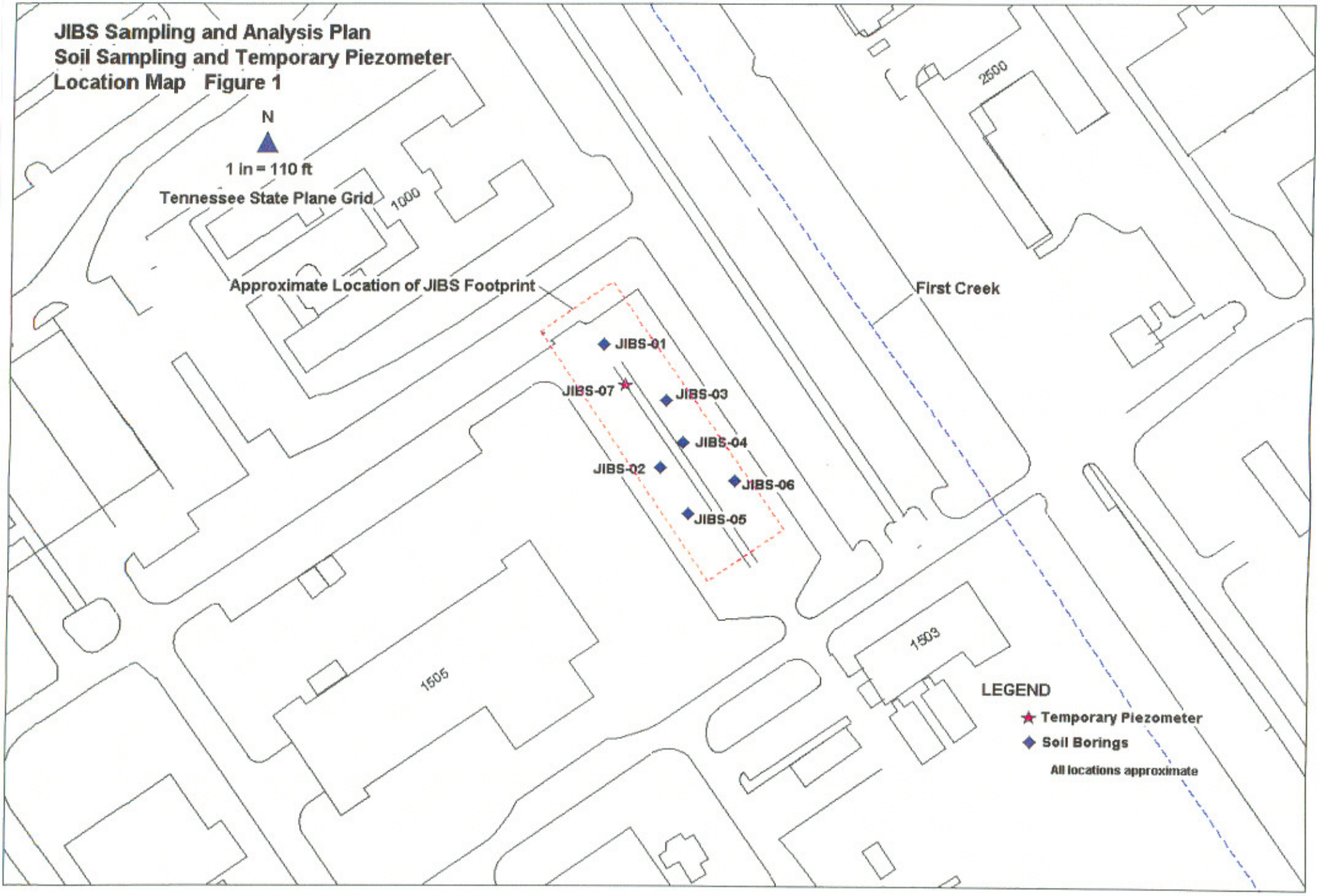
JIBS Sampling and Analysis Plan
Soil Sampling and Temporary Piezometer
Location Map Figure 1
N
1 in = 110 ft
Tennessee State Plane Grid
1000
2500
Approximate Location of JIBS Footprint
First Creek
JIBS-01
JIBS-07
JIBS-03
JIBS-04
JIBS-02
JIBS-06
JIBS-05
1505
1503
LEGEND
Temporary Piezometer
Soil Borings
All locations approximate

Joint Institute of Biological Sciences (JIBS) Project-Specific Sampling and Analysis Plan
Soil, Rock, and Groundwater Sampling – SP2449(a)

Environmental Protection and Waste Services Division
Oak Ridge National Laboratory

UT-Battelle, LLC

Joint Institute of Biological Sciences Project-Specific Sampling and Analysis Plan (SAP)
Soil, Rock, and Groundwater Sampling – SP2449

Background

Problem Statement

The Joint Institute of Biological Sciences (JIBS) facility is proposed to be constructed on a 1 acre parcel of land located approximately 100 feet east of Building 1505 in an existing parking lot. The design of the JIBS facility will include an elevator which will necessitate the installation of an elevator piston shaft on the JIBS site. The design of the elevator will require that the elevator piston shaft be approximately 40 feet deep and 1.25 feet (15 inches) in diameter. The design of the elevator dictates excavation greater than ten feet below land surface datum (BLSD) in an unrestricted industrial use area per the *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee* which makes characterization of the subsurface necessary. Consequently, the purpose of the sampling outlined in this SAP is to perform a screening-level characterization of soil, bedrock, and groundwater for volatile organic compounds (VOC), metals, and radiological constituents in order to identify, and implement, required mitigating measures in support of the construction of the elevator piston shaft and facility operations.

Project Organization

UT-Battelle Operations

The project manager (PM) for Design and Construction of the JIBS facility is Jack Stellern, Facilities and Development Division (FDD), UT-Battelle. The PM for Environmental Characterization is Lance Mezga, FDD, UT-Battelle. The PM for Field Sampling Support is Terry Bonine, UT-Battelle Environmental Protection and Waste Services Division (EPWSD) and the Special Projects Manager is Scott Fleming, EPWSD UT-Battelle. Sampling technicians are Richard Allen and J. B. Watson, EPWSD UT-Battelle. Administratively, the PM for Environmental Characterization will lead characterization efforts at the JIBS site. The Field Sampling PM and the Special Projects Manager are matrixed to the PM for Environmental Characterization, providing support. The sampling technicians report to the Field Sampling PM or Special Projects Manager during field operations. The Special Projects Manager will provide data review and verification services. Providing overall environmental compliance support is the EPWSD Environmental Protection Services Manager, David Skipper. The PM for Environmental Characterization, PM for Field Sampling Support, the Special Projects Manager, and the Environmental Protection Services Manager are all signatories to this SAP (see Section H).

DOE Operations

The DOE Oversight PM is Mark Belvin. He will provide oversight of all environmental characterization activities performed on the JIBS site. The DOE Oversight PM will provide liaison services to the DOE Environmental Management PM, Elizabeth Phillips.

Decision Approach

Analytical data generated by the SAP will be compared against established background level concentrations found in the *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Final Report on the Background Soil Characterization Project at the Oak Ridge Reservation, Oak Ridge, Tennessee, Volume 1 - Results of Field Sampling Program, October 1993*, DOE/OR/01-1175/V1, and *Final Report on the Background Soil Characterization Project at the Oak Ridge Reservation, Oak Ridge, Tennessee, Volume 2 - Data, October 1993*, DOE/OR/01-1175/V2 as well as contaminant ranges found in the *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*. Should this comparative analysis indicate the presence of contamination above levels of concern, safety measures appropriate to the risk of exposure will be employed to protect workers during the installation of the elevator piston shaft. Any waste generated during the installation of the elevator piston shaft will be managed in accordance with appropriate waste management procedures in effect at ORNL. Moreover, Bechtel Jacobs Company representatives will be notified regarding the findings. Decisions regarding the level of personal protection and monitoring will be made by senior staff within the Operational Safety Services Division (OSSD) with input from the PM for Environmental Characterization, the EPWSD Environmental Protection Services Manager, and the Department of Energy.

Health and Safety Plan

A health and safety plan or similar document will be developed by the drilling subcontractor for drilling operations and will cover subcontractor drilling operations.[49] The health and safety document will be reviewed UT-Battelle OSSD safety personnel as well as UT-Battelle sampling technicians or others having business within established buffer or exclusion work zones.[50] Routine sampling activities performed by UT-Battelle sampling technicians will be covered by a UT-Battelle Job Hazard Evaluation (JHE) (see Section E). The JHE will be written for this project by an OSSD staff member.

Site Related Contaminants

Based on process knowledge, no known contamination exists on the JIBS site. Moreover, no known subsurface soil or groundwater sampling results exist for the area comprising the JIBS footprint. However, review of historical groundwater data[51] from the three wells closest to the JIBS site indicate minor concentrations of radionuclides were found in groundwater. The depths of these three groundwater monitoring wells (Wells 535, 536, and 810) are 15 feet, 19 feet, and 16 feet BLSD, respectively. These wells are shown on Figure 1. The historical groundwater data for these wells do not indicate the presence of volatile organics at levels of concern. Based on historical data reviewed, past usage of the parcel (and areas adjacent to the site), and prudence, soil and groundwater samples collected per this SAP will be analyzed for VOC, metals, and radiological constituents and rock core samples will be analyzed for metals and radiological constituents. In particular samples will be analyzed for VOC per SW-846 Method 8260B, metals per SW-846 Method 6010b, and radiological constituents [gross activity – alpha/beta (EPA Method 900.0), and gamma emitters (EPA Method 901.1). See Section C].

A. Identifying Information

1) Project Name: JIBS Soil, Rock, and Groundwater Sampling

2) Special Project No.: 2449

3) Material Description/Matrix: Solid (soil/rock core) and liquid (groundwater)

4) Number of Containers in Waste Stream: N/A

5) Material Type: Unknown – most likely clay-rich soils mixed with fill and rock fragments (Ca, Mg carbonate and shale), carbonate and shale bedrock, and groundwater

6) WID Container No.: NA

7) Sampling Locations: One boring will be advanced into the soil and rock to a total depth of 40 feet BLSD. This rock boring will be converted into a temporary piezometer for the purpose of collecting a groundwater sample. The location of the rock boring/temporary piezometer will correspond to the approximate location of an elevator piston shaft which is required for the JIBS building elevator. The drilling equipment used to collect soil samples will consist of hollow stem auger/rotary core drill with discrete interval sampling capability (split spoon sampler). The drilling device will be used to collect samples of rock core and will advance the corehole to allow placement of the temporary piezometer. See Figure 1 in the Appendix and References Section of this SAP for boring location in relation to the JIBS site.

B. Sampling Information

1) General: The preliminary geotechnical investigation of the JIBS footprint conducted in

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[49] UT-Battelle sampling technicians will be covered under the drilling contractor's health and safety document when they are within the buffer and exclusion work zones during drilling operations.

[50] Anyone entering the buffer or exclusion work zones established by the drilling subcontractor may be required to sign the health and safety document signifying that the signatory has read and understood the requirements..

[51] Oak Ridge Environmental Information System.

November 2004 revealed a relatively uniform depth to bedrock on the order of 8 to 10 feet BLSD. Soil Samples – Soil samples will be collected from the boring at five foot intervals (sample collected at five feet BLSD and possibly at 10 feet BLSD, depending on depth to drilling refusal). Rock Core Samples - The boring will be advanced to a depth of 40 feet BLSD and this boring will be converted into a temporary piezometer for collection of groundwater samples. A soil or rock sample will be collected at 10 feet BLSD, depending on the depth to rock and rock core samples will be collected at 20 feet and 40 feet BLSD. Core samples will be collected in general accordance with "Standard Operating Procedure for Core Barrel Sampling for Subsurface Earth Materials." Groundwater samples – a peristaltic pump or submersible bladder pump will be used to collect groundwater samples from the temporary piezometer. The temporary piezometer will consist of 2 inch (ID) PVC with flush threaded couplings and will have a 10 foot screen from 30 feet to 40 feet BLSD. The piezometer screen will have a nominal 10 slot opening size. The temporary piezometer will have a bottom cap installed at the base of the screened interval. Clean quartz sand will be placed around the screened interval to a depth of less than 2 foot above the screened interval and a 2 foot annular seal (certified sodium bentonite pellets) will be placed above the screened interval. Bentonite cement will be used to fill the remainder of the annular volume (from annular seal to surface). The temporary piezometer will be developed prior to sampling. The well development process is outlined in the Appendix and References Section. After sampling activities are completed, the temporary piezometer will be removed while plugging the borehole with bentonite cement.

With the exception of rock core, all samples collected under this SAP will be analyzed for radiological constituents, metals, and VOC (see Section C). Because rock core cannot reliably be analyzed for VOC, groundwater collected from the temporary piezometer will be analyzed for VOC in lieu of rock core.

Sampling equipment to be used during characterization efforts at the JIBS site include
a) hollow stem auger/rock core drill rig mounted on an all terrain vehicle – this equipment will be used to advance sampling tools to the sampling intervals of interest (nominally 5, 10, 20, and 40 feet BLSD)
b) split spoon samplers – split spoons will be used to collect soil samples over discrete depth zones of interest (5 and possibly 10 feet BLSD)
c) rock core barrels – core barrels will be used to collect rock core over discrete depth zones of interest [10 (possibly), 20, and 40 feet BLSD]
d) En Core sampling devices – En Core samplers will be used to collect soil samples earmarked for VOC analysis
e) disposable stainless steel spatulas or spoons – this equipment will be used to facilitate removal of soil from split spoons
f) sample containers appropriate to the analyses to be performed will be used to contain samples during shipment to the laboratory (See Section C)
g) a temporary piezometer constructed in the borehole (JIBS-01) will be used to collect groundwater samples.

Grab samples of soil will be collected from 5 and possibly 10 feet BLSD (depending on depth to drilling refusal/depth to rock) to characterize those zones of interest. Based on historical data reviewed and past usage of the parcel (JIBS site process knowledge), there is reasonable expectation that subsurface earth materials at the JIBS site are not contaminated. However, the level of variability or extreme concentrations in the earth materials at the JIBS site is unknown. Grab samples collected at the discrete zones outlined above should yield representative samples to confirm the absence of contaminants at levels of concern and to provide information on the variability of concentrations in earth materials sampled from the boring. Grab samples processed, analyzed, and evaluated individually normally reflect maximum variability across the intervals sampled, and thus reasonably characterize the range of contaminant concentration over the intervals sampled. Composite samples tend to "dilute" the concentrations of contaminants in the sample. Thus, for a well-formed composite, a single measured value should be similar to the mean of measurements of the individual components of the composite. Composite sampling should not be used if the integrity of the individual sample values changes because of the physical mixing of samples. The integrity of individual sample values could be affected by chemical precipitation, exsolvation, or volatilization during the pooling and mixing of samples. For example, grab sampling at discrete intervals is preferred over composite samples for VOC analysis.

2) Preservation Method: Soil samples - Soil samples earmarked for VOC analyses will NOT be preserved in the field by EPWSD technicians. Soil samples will be stored on ice in the field in zip-lock bags. If soil samples are not shipped on the day of sample collection, then soil samples will be shipped the next day within 24 hours of sample collection at 4 +/- 2 degrees Celsius. Once samples are received at the laboratory they must be preserved by the laboratory extruding the sample into organic-free water and frozen or analyzed within 48 hours from the time of sample collection. Rock Core Samples – Rock core samples will not be preserved. Groundwater samples – Groundwater samples will be preserved in accordance with the analytical method outlined in Section C. Nitric acid (pH< 2) will be used as a preservative for groundwater samples slated for metal and radionuclide analyses. HCl (pH < 2) will be used to preserve groundwater samples slated for VOC analyses. All samples collected will be cooled down to 4 +/- 2 degrees Celsius and shipped to the laboratory at that temperature. *All samples collected will be shipped to the laboratory via overnight express*.

3) Holding Times: There is a holding time of 6 months for ICP Metals (28 days for Hg). Radiological contaminants have a 6 month holding time. The holding time for VOC is 48 hrs from time of sample collection to preservation by the laboratory or analyzed. Soil samples will be preserved by the laboratory, therefore the holding time is extended to 14 days from the time of sample collection. Maximum holding time for VOC in groundwater is 14 days.

4) Sampling Technique Employed: Soil - Split spoons sampling tools will be used to bring soil samples to the surface. Grab samples of soil will be collected directly from the sampling tool used to bring the soil to the surface. Soils earmarked for VOC analyses will be collected using En Core sampling devices. Composite soil samples are NOT to be collected. Rock Core: Grab samples of rock core will be collected directly from the core box at the depths designated above. Groundwater: one grab sample will be collected from the temporary piezometer using a peristaltic pump and clean tubing or a clean submersible bladder pump. Low-flow purging will be performed prior to sampling. In addition, low flow sampling (<200 mL/min) will be performed to permit collection of samples for VOC analysis. With the exception of rock core samples, all samples will be analyzed for radionuclides, metals and VOC. Rock core will not be analyzed for VOC.

5) Visual Inspection Performed: N/A

6) Field Contacts: Jack Stellern, ph. 574-6434, mobile. 385-5355; Lance Mezga, ph. 574-7298, pg. 873-7767; Terry Bonine, ph. 574-7363, pg. 873-6455; Scott Fleming, ph. 241-9673, pg. 873-5563

7) Send Results to: Scott Fleming, 4500N, D034

8) Data Deliverable: ICPT Basic Order of Agreement (BOA) standard data deliverable which includes electronic data deliverable, signed COC, case narrative, result forms, and appropriate QA/QC forms.

9) Charge No.: 3EVDCL02

10) Required QA/QC Samples:

Field QA/QC	Yes	No
Trip Blank	_X_[52]	____
Field Blank	____	_X_
Decon. Rinsate	_X___	____
Field Duplicate	____	_X_

11) Additional Documentation of Field Activities: Field log sheets document aspects of the sample collection and handling, as well as pertinent visual observations. Per SOP-ESP-003.14, "Sample Document Control," complete the following specific information on the field log sheets during sample collection activities - project identification, location, date and time of entry, interior or exterior environment temperature, unique sample identification and description,

[52] One Trip Blank per cooler (Ottawa Sand) will be included in each cooler containing soil samples for VOC. The Ottawa Sand will be provided by the laboratory to ORNL. One trip blank will be included for groundwater and rinsate samples. The trip blank will be prepared by EPWSD and included with the samples shipped to the laboratory.

sampling equipment used, comments, and sign offs by radiological control, industrial hygiene, facility, and EPWSD personnel involved in collection of the samples. Chain-of-custody (CoC), sample containers, and sample identification are documented on appropriate form the CoC form and field log sheets. The CoC process is utilized to ensure the integrity of a sample from collection to delivery to an analytical laboratory. The CoC form is to be completed (per SOP-ESP-003.002 "Chain of Custody") in conjunction with the field log sheets. Specifically, the following information is to be filled out on the CoC form: sample identity, sampling data, sampling time, sample type, container type, preservative, and analytical suite requested. Additionally, the project number and laboratory are to be identified in the spaces provided on the CoC form. All sampling technicians involved in collection of the samples are to sign the CoC form twice: once in the Sampler Signature box and once in the Relinquished by box. Custody seals are to be filled out and applied to each individual sample container. Each sample container is to have an I-Chem sample label applied and this label shall be completely filled out (Client/Source, Site Name, Sample Number, Analysis, Grab/Composite Sample, Date, Time, Preservative, and initials of the sampling technician collecting the sample. Field quality control processes followed by EPWSD originate from the New Jersey Department of Environmental Protection's *NJDEP Field Sampling Procedures Manual*. New Jersey Department of Environmental Protection and U. S. Environmental Protection Agency's *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*.

As stated above, one boring will be drilled for the purpose of sampling subsurface soils, rock core, and groundwater. The proposed boring location was based on the design of the elevator piston shaft supporting the JIBS facility.

Nominally 2 soil samples will be collected (at five foot intervals) from the boring – this number is based on the expectation that soil thickness at the proposed JIBS site averages approximately 8 to 10 feet BLSD. Soil slated for metals and radionuclide analyses will be sampled using clean disposable sampling stainless steel spoons or spatulas. The soil samples slated for volatile organic analysis will collected to meet the requirements of EPA Method 5035, or equivalent guidance [e.g., Washington State Department of Ecology's *Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5* dated 22 Jun 04]. En Core 5 gm disposable samplers will be used to collect soil samples that are to be analyzed for VOC. At least 3 aliquot samples for every 5 foot interval will be collected and submitted for VOC analysis. See the Appendix and References Section for a copy of the instructions for using the En Core Sampler. Moisture content data will be obtained from the metals analysis. The laboratory must have the soil moisture content information so that it can normalize the soil VOC concentration to a dry weight basis.

Rock core samples will be selected from the core box at the depths described above and will be processed to increase the surface area for laboratory analyses. Any processing will be performed using clean implements (clean hammer and chisel, mortar and pestle, etc.) These implements will be decontaminated between processing steps. Groundwater samples will be collected using a peristaltic pump and clean tubing or clean submersible bladder pump. If used, the submersible bladder pump will be disassembled and decontaminated after sampling activities are completed.

As stated above, radiological constituents, metals, and volatile organics are the contaminants of concern (see Section C).

Related Sampling Activities

Vapor Measurements

A trained Environmental Protection and Waste Services Division (EPWSD) sampling technician will collect vapor measurements in soil brought to the surface at the boring location using a calibrated photoionization detector (PID). This will be performed as a screening tool only. The EPWSD sampling technician will perform screening level measurements during drilling operations as the soil is brought to the surface. (Note rock core will not be screened in the field for vapor content.) A log will be used to document all measurements made with the PID. Vapor measurements will be correlated with drilling depth in the field log.

Radiological Survey Measurements

A trained Radiological Safety Services (RSS) radiological control technician (RCT) will perform radiological surveys at the boring locations. Large area smears using Masslin hand wipes (smear

samples) will be collected from selected areas of the drilling and ancillary equipment before and after deployment in the field. Bicron Surveyor M radiological survey instruments equipped with Geiger-Mueller (GM) beta/gamma pancake probes and A-50 ZnS alpha scintillation bear claw probes will be used to detect the presence of alpha, beta, or gamma contamination picked up by the hand wipes. The same instruments will be used in periodic "direct frisking" of the soil and rock samples brought to the surface by the sampling tool. All radiological survey meters used will be calibrated and will meet the requirements of performance testing in accordance with ORNL SOP 02-560-01, "Control of Health Physics Instruments." Moreover, the radiological control technicians will use *Radiological Management of Excavated Soil*[53] to determine the radiological requirements for managing the disposition of the earth materials surveyed.

Hot Spot Sampling

Should PID or radiological surveys identify a "hot spot"[54] in soil, a sample will be collected from the hot spot for further testing. Vapor Screening - Should soil exceed 3X the background vapor concentration during vapor screening, an approximate 75 to 100 gm aliquot[55] of soil will be placed in a clean 250 mL wide mouth glass jar and aluminum foil securely fastened on the jar opening. The sampling jar containing the suspect soil will be tightly covered in aluminum foil to reduce the loss of volatile constituents. The jar containing the suspect soil will be placed on the dashboard of a heated vehicle (with defroster running). After 10 minutes, the jar will be removed from the vehicle (and carried upwind of vehicle exhaust) and the aluminum lid will be punctured by PID probe in order to collect a measurement. Should the measurement exceed 5X the background concentration, a sample of the suspect soil from the hot spot zone will be collected for volatile organic analysis. Radiological Screening - Radiological hot spots will be determined by project RCTs. The EPWSD sampling technicians will collect a sample from a radiological hot spot upon instruction by project RCTs. Staining - Should soil exhibit visible staining, the stained area will be considered a hot spot and a sample will be collected.

Decontamination

Sampling tools and implements (split spoons, etc.) will be decontaminated by EPWSD personnel between each interval sampled. Disposable sampling tools will be discarded and not decontaminated. One sample of decontamination rinse water will be collected for analysis. Decontamination wastewater will be held for disposal at Duratek's on-site liquid treatment operations pending results of the decontamination rinse water analyses.

Borehole Selection

The location of the elevator piston shaft is a function of the design of the JIBS facility.

Results of Field Surveys

The results of the radiological survey and PID screening will be reported to the EPWSD Special Projects Manager and these data will be communicated to the Environmental Characterization PM.

C. Analytical Requirements

The following analyses will be performed by the Paragon Analytics, Inc (PAI) in Fort Collins, CO. The PAI contact is Ms. Julie Ellingson [(970) 490-1511] and the UT-Battelle Special Projects Manager is Scott Fleming [(241-9673)]. Samples will be transported to PAI via overnight delivery transporter. A 14 day turn-around-time from laboratory sample receipt to data deliverable will be required for all analyses requested in the table below.

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[53] This subject area is found on ORNL's Standards-Based Management System.

[54] For the purposes of this SAP a volatile hot spot will be defined as 5X volatile background, or visible staining of the soil.

[55] The soil will be broken up into small pieces and quickly placed into the wide mouth sample jar and covered.

Analyte	Method	MDA or Detection Limit	Matrix	Number of Soil/Rock Core/Groundwater Samples (not including blanks/decon. rinsate/hotspots/ etc.)
Metals	EPA SW-846 Method 6010B (ICP)	Lowest achievable	Solid/Liquid	~5
Hg	EPA SW-846 Method 7471A – Solid 7470A - Liquid	Lowest achievable	Solid/Liquid	~5
Gross Alpha/Beta	EPA Method 900.0	Lowest achievable	Solid/Liquid	~5
Gamma Spectrometry Scan	EPA Method 901.1	Lowest achievable	Solid/Liquid	~5
VOC	SW-846 5035 (Solid Only)/8260B	Low concentration method	Solid/Liquid	~3 (~6 actual 5 gm En Core samplers based on collection of 2 soil samples)

Sample mass and volume needed:

Metals (plus Hg): Solid - minimum of 250 gms ; liquid – 1 L
Radiological: Solid - minimum of 250 gms; liquid – 1 L **(collect 2x the stated amounts for archival purposes)**
Volatile organics: Solid - 15 gms – 3 x 5 gm En Core samplers (see Appendix and References Section); liquid – 3 x 40 mL
Moisture content will be derived from metals analyses and applied to other parameter results.

D. Waste Stream Distribution

Subsurface earth materials at the JIBS site are not known to contain Resource Conservation and Recovery Act (RCRA), Toxic Substance Control Act (TSCA), or radiological constituents at greater than background levels. However groundwater samples collected from wells located near the JIBS site indicate the presence of low levels of radiological constituents. Sample residuals will be disposed of by PAI. Waste earth materials and any personal protective equipment used during sampling will be containerized and held until analytical results are received from the laboratory. The analytical data will be analyzed by UT-Battelle staff and if the solid wastes are found to contain contaminant levels which exceed regulatory levels, these wastes will managed in accordance with UT-Battelle procedures and will be processed by Bechtel Jacobs Company for off-site disposal. Should the solid waste generated by the project not contain RCRA, TSCA, or radiological constituents at regulated levels, it will be sent to the Y-12 Landfill for disposal. Likewise, development and purge water will be containerized and held until results of analyses of the groundwater sampled from the temporary piezometer are obtained. A copy of the analytical results will be reviewed by the Duratek Liquid Waste Certification officer and appropriate actions will be taken to dispose of the development and purge water at one of Duratek's on-site liquid waste processing treatment units.

E. Safety Concerns

A JHE will be written for this project by an OSSD staff member. A copy of the JHE must be read and signed by all sampling technicians involved in the sampling activities. In addition, a Work Plan will be in place for this project.

As stated above, a health and safety plan, or similar document, will be generated by the drilling contractor for drilling operations.

F. Data Management and Verification

Prior to initiating field sampling activities, sampling technicians will generate a unique identifier for each sample collected.

The laboratory will be requested to provide electronic data deliverables, signed field chain-of-custody forms, a case narrative, sample results, supporting quality assurance and quality control forms to support data quality.

To ensure the quality of analytical data, results will receive 100% data review and verification by the EPWSD Special Projects Manager. Data validation will not be performed on the JIBS project data. Data review and verification will be performed per the following EPWSD procedures:

Guidance for Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry and Inductively Coupled Plasma-Mass Spectrometry Data Verification and Validation (EPWSD-QPA-TP-203)

Guidance for Mercury and Metals by Atomic Absorption Data Verification and Validation (EPWSD-QPA-TP-208)

Guidance for Radiochemical Data Verification and Validation (EPWSD-QPA-TP-202)

Guidance for Volatile and Semivolatile Data Verification and Validation (EPWSD-QPA-TP-205)

G. Procedures

The following procedures are the basis for the collection and management of samples and described in this SAP:

- *Chain of Custody*, EPWSD SOP-ESP-003-002
- *Special Projects*, EPWSD SOP-ESP-003.084
- *Sampling Document Control*, EPWSD SOP-ESP-003.014
- *Packaging Environmental and Waste Samples for Offsite Shipments*, EPWSD-EPS-TP-756 (DRAFT)
- *Utilization of MicroTIP MP-1000 for Headspace Analysis*, EPWSD SOP-ESP-003.015
- *ORNL Groundwater Sampling Program*, EPWSD-EPS-TP-741(DRAFT)
- *Standard Operating Procedure for Core Barrel Sampling for Subsurface Earth Mat*erials, Risk Reduction and Environmental Stewardship – Remediation Services Project, Los Alamos National Laboratory, SOP-06.26, Rev. 2, ER2003-0522, 04 Jan 04
- EPA Method 5035, or equivalent guidance, e.g., Washington State Department of Ecology's *Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5*), 22 Jun 04
- *Disposable En Core Sampler Sampling Procedures*, En Novative Technologies, Inc.
- *Sampling Equipment Decontamination*, Rev. #:0.0 – SOP#: 2006, U. S. Environmental Protection Agency, 14 Aug. 94.
- *Guidance for Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry and Inductively Coupled Plasma-Mass Spectrometry Data Verification and Validation*, EPWSD-QPA-TP-203
- *Guidance for Mercury and Metals by Atomic Absorption Data Verification and Validation*, EPWSD-QPA-TP-208
- *Guidance for Radiochemical Data Verification and Validation*, EPWSD-QPA-TP-202
- *Guidance for Volatile and Semivolatile Data Verification and Validation*, EPWSD-QPA-TP-205

H. **Signatures**

Environmental Protection Services Manager EPWSD	3/28/05 Date
Environmental Characterization Project Manager EPWSD	28 Mar 05 Date
Field Sampling Support Project Manager EPWSD	28 Mar 05 Date
Special Projects Manager EPWSD	28 MAR 05 Date

Appendix and References

Map of Proposed JIBS Site Containing Boring Locations

Well Development Work Aid

Collecting and Preparing Soil Samples for VOC Analysis – Implementation Memorandum #5 dated 22 June 04. Washington State Department of Ecology. http://www.ecy.wa.gov/pubs/0409087.pdf

Disposable En Core Sampler Sampling Procedures, En Novative Technologies, Inc. http://www.ennovativetech.com/encore/sampProced1.pdf

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Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells. EPA/600/4-89/034, U. S. Environmental Protection Agency, March 1991.

NJDEP Field Sampling Procedures Manual. New Jersey Department of Environmental Protection, January 2001.

RCRA Ground-Water Monitoring Technical Enforcement Guidance Document. OSWER-9950.1, U. S. Environmental Protection Agency, September 1986.

Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee. DOE/OR/01-1862&D4, Bechtel Jacobs Company, May 2002.

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Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. DOE/OR-1043/V3&D1, Bechtel National, Inc., September 1992.

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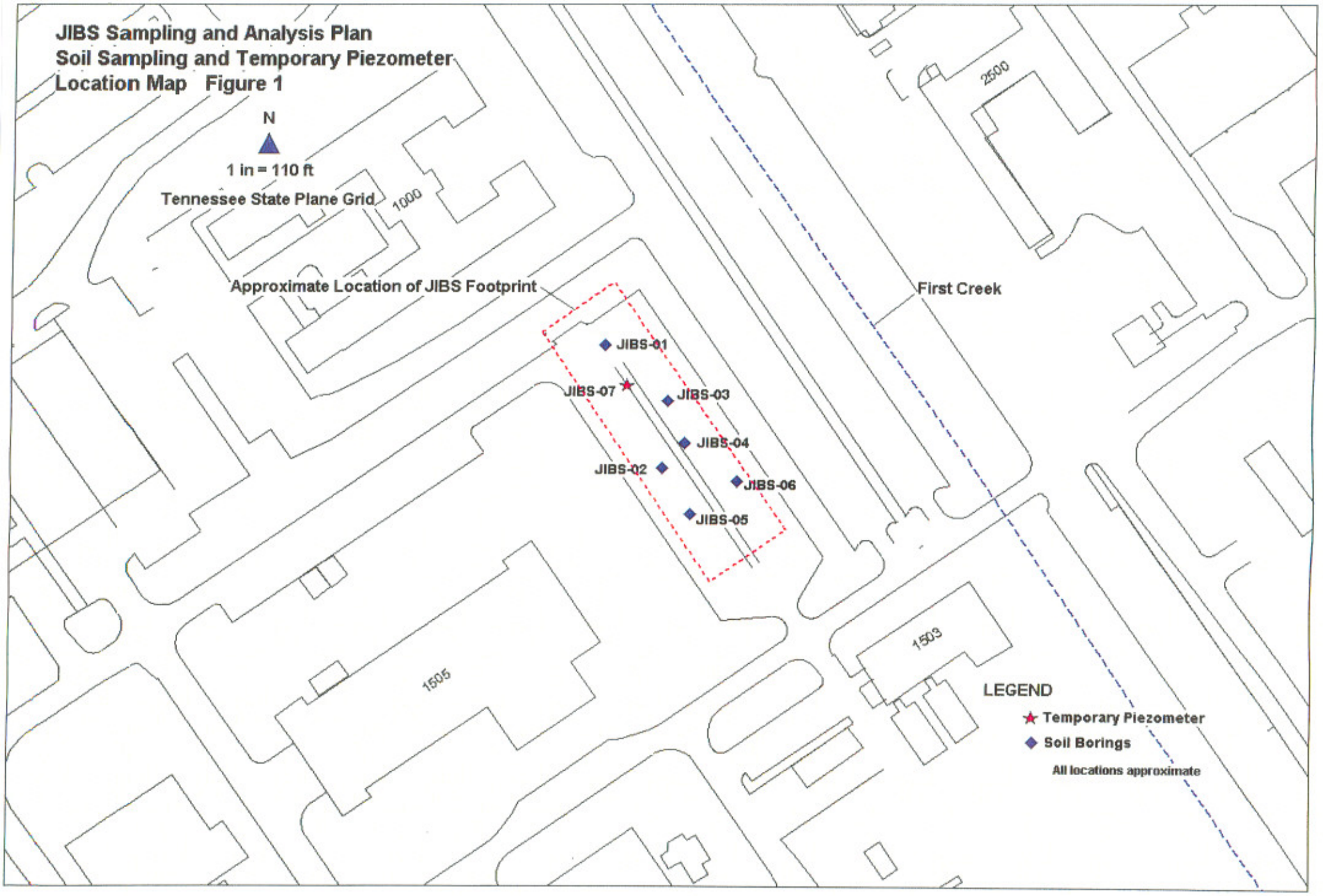

JIBS Sampling and Analysis Plan
Soil Sampling and Temporary Piezometer
Location Map Figure 1
N
1 in = 110 ft
Tennessee State Plane Grid
1000
2500
Approximate Location of JIBS Footprint
First Creek
JIBS-01
JIBS-07
JIBS-03
JIBS-04
JIBS-02
JIBS-06
JIBS-05
1505
1503
LEGEND
Temporary Piezometer
Soil Borings
All locations approximate

Well Development Work Aid

The objective of well development is to remove any water or drilling fluids introduced into the well during drilling, stabilize the filter pack and formation materials opposite the well screen, minimize the amount of fine-grained sediment entering the well, and maximize well efficiency and inflow of water to the well. Initial development of the well occurs during placement of the filter pack, prior to placing the filter pack and annular seals in the well. Final development of the well occurs after the annular seal has been placed and allowed to set. Wells should be developed as soon as possible after construction, but no sooner than 24 hours after placing the annular seal. **Initial development of the temporary piezometer will be performed by the drilling contractor; final development will be performed by EPWSD sampling technicians.**

Develop the entire vertical screened interval using surge blocks, bailers, pumps, or other equipment which frequently reverses the flow of water through the well screen and prevents bridging of formation or filter pack particles. The following guidance should be followed in the development of the temporary piezometer:

- Do not introduce non-formation water into the temporary piezometer during development.
- Air-lift pumping techniques are not to be employed in the development of the temporary piezometer.
- Surging using a bailer will be used during final development of the temporary piezometer. Agitation should be vigorous for 30 minutes prior to removal of formation water.
- Development is considered complete only when all water introduced during drilling plus a minimum of five (5) to ten (10) well bore volumes (33 gallons to 66 gallons, respectively) have been removed from the well, the water is chemically stable, and is, as free of sediment as possible.
    - During development, remove at least 5 well bore volumes from wells completed in fine-grained strata such as silty or clayey sands, or silts (ASTM Groups SM, SC, ML) or bedrock with estimated hydraulic conductivities less than 10^{-3} centimeters per second (cm/sec). Remove at least 10 well bore volumes from wells completed in coarse-grained strata such as sands, gravels, or mixtures of sand and gravel (ASTM Groups SP, SW, GP, GW) with estimated hydraulic conductivities greater than 10^{-3} cm/sec. **Remove a minimum of 5 bore volumes (33 gallons) from the temporary piezometer after agitation with the bailer.**
    - Water produced from the well is considered chemically stable when field parameters (pH, temperature, specific conductance, and dissolved oxygen) remain within five percent of the previous measurement for at least three successive borehole volumes.
    - Water produced from the well is considered free of sediment when water produced is clear and/or has a turbidity reading less than 5 NTU for at least three successive borehole volumes.
    - Continue to remove formation water at 5 bore volumes (33 gallons) until the formation water is considered chemically stable and is free of sediment. Should formation water not meet the stability and turbidity levels outlined above after a total of 15 bore volumes (99 gallons) have been removed, contact the PM for field sampling support for instructions.

Development water will be disposed of in accordance with the requirements found in D, above.

Appendix F

Joint Institute for Biological Sciences (JIBS) Environmental Sampling Results

JOINT INSTITUTE FOR BIOLOGICAL SCIENCES (JIBS) ENVIRONMENTAL SAMPLING RESULTS

Discussion of Sampling/Analytical Approach

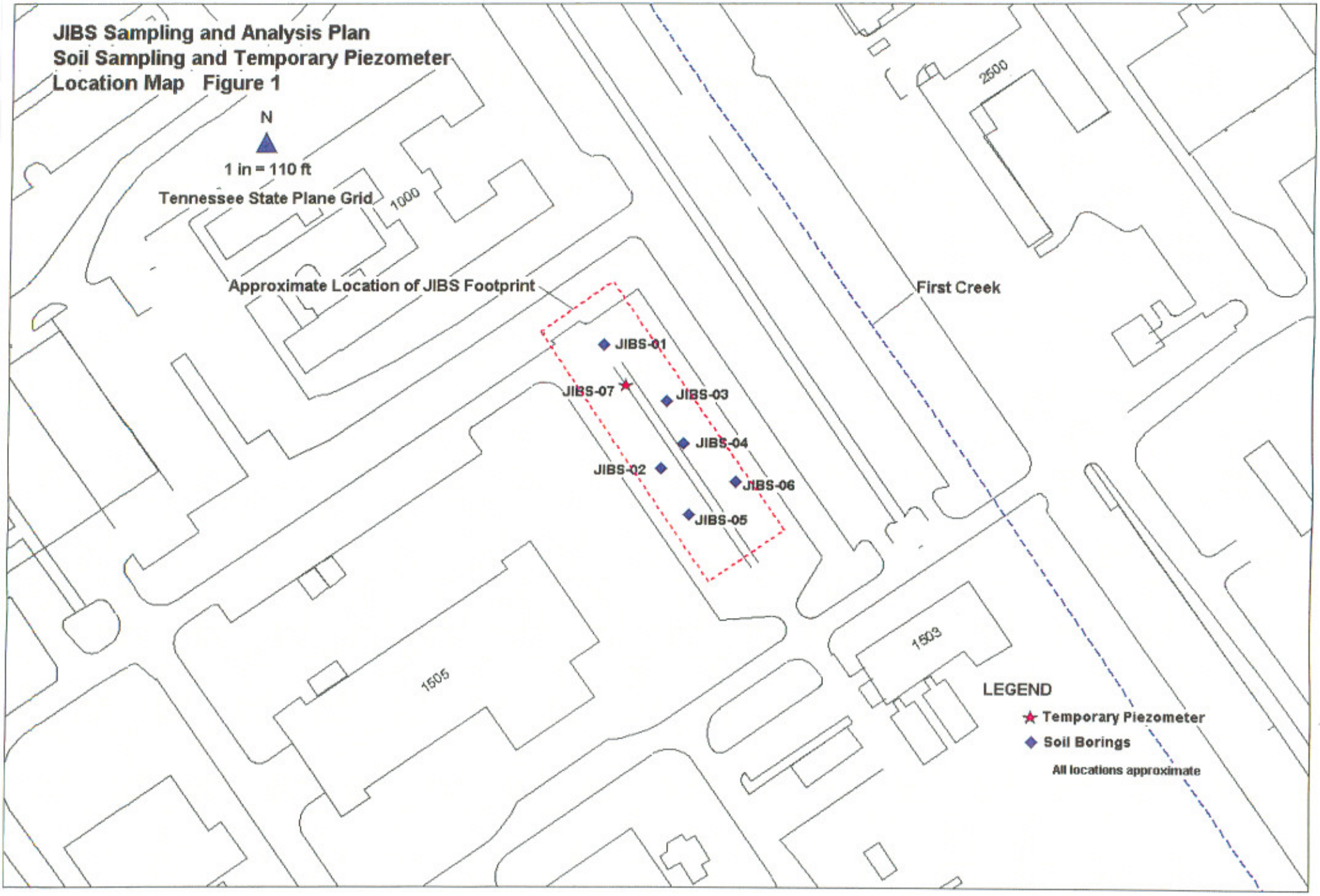
On March 28 through 31, 2005, samples of soil and rock from different locations and depths at the Property and a groundwater grab sample were collected to verify that transfer of the Property and the excavation needed to construct the Joint Institute for Biological Sciences (JIBS) would be protective of human health and the environment. Sampling locations were selected based on the area of the Property, the planned location of the JIBS elevator piston (a 12 inch diameter hole to 37 ft below land surface datum [BLSD]), and internal procedures. The internal procedures are based on and consistent with Environmental Protection Agency (EPA) methodology, including EPA's Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EPA Region IV, May 1996). Figure 1 is a map of the proposed JIBS site showing the sampling locations. The sampling and analysis plans (SAPs) for this environmental screening and geotechnical investigation were previously provided to EPA Region IV for review.

Six soil borings and one rock core boring were drilled into the subsurface of the Property as part of the investigation. Twelve soil samples were collected from the six soil borings (two samples from each boring) and one soil and three rock samples were collected from the rock core boring. The rock core boring was converted to a piezometer for the purpose of collecting a grab sample of groundwater. The borings were advanced to auger refusal near the soil-bedrock interface. The rock core boring was advanced into the soil and rock to a total depth of 42.8 feet BLSD. Table 1 provides a summary of the soil and rock borings and samples, including the depth to refusal at each location.

TABLE 1
Borehole and Sample Summary, March 2005, JIBS Site

Borehole	Depth to Refusal (ft BLSD)	No. of Samples (Media)	Approximate Sample Depth(s) (ft BLSD)
JIBS-01	9	2 (soil)	5, 7
JIBS-02	9.5	2 (soil)	4, 8
JIBS-03	8	2 (soil)	5, 7
JIBS-04	7.5	2 (soil)	5, 6
JIBS-05	8	2 (soil)	5, 7
JIBS-06	8	2 (soil)	5, 7
JIBS-07	6.8 (total depth = 45.8)	1 (soil), 3 (rock)	6, 10, 20, 40

BLSD = Below land surface datum


JIBS Sampling and Analysis Plan
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1 in = 110 ft
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JIBS-02
JIBS-06
JIBS-05
1505
1503
LEGEND
Temporary Piezometer
Soil Borings
All locations approximate

The location of the rock core boring (JIBS-07)/temporary piezometer corresponds to the approximate location of the proposed elevator piston, which is required for the JIBS building elevator and is the only part of the JIBS facility that will exceed 3 m (10 ft) in depth. The drill rig was equipped with a split spoon sampler to collect soil samples at 5 foot intervals (to auger refusal, nominally 8 to 10 feet BLSD). Rock core samples were collected at the soil-rock interface (at about 10 feet BLSD), at 20 feet BLSD, and at 40 feet BLSD. Soil samples were collected from the split spoon sampler using En Core® samplers for volatile organic compounds (VOCs) analysis. The VOC samples were collected using EPA Method 5035A and Washington State Department of Ecology's Collecting and Preparing Soil Samples for VOC Analysis—Implementation Memorandum # 5.1. Soil samples were not preserved in the field; they were shipped overnight to Paragon Analytics for analysis. Preservation was completed in accordance with Method 5035A by laboratory personnel upon receipt of the samples.

Soil samples were collected from the split spoon sampler using clean disposable sampling spoons for metals and radiological analyses. Rock samples were collected from rock core barrels for metals and radiological analyses. The groundwater grab sample was collected from the temporary piezometer installed in the rock core boring using a disposable Teflon bailer following development of the piezometer in accordance with standard industry practices. This was a deviation from the SAP due to operational problems with the submersible bladder pump and unavailability of electricity for operation of a peristaltic pump. The groundwater samples were preserved in the field in accordance with the procedures specified in the SAP.

EPA Methods 8260B and 6010B were used for the VOC and metals analyses, respectively. EPA Method 7471A was used to analyze the soil and rock samples for mercury and Method 7470A was used to analyze the groundwater sample for mercury. EPA Methods 900.0 and 901.1 were used for gross alpha/gross beta and gamma spectroscopic analyses, respectively. The specific analytes for each of these methods are included in Attachment A.

Groundwater was only encountered in the temporary piezometer. Groundwater was encountered at a depth of 8.65 feet BLSD at 24 and 36 hours after installation.

Vapor Measurements

In addition to the collection of soil, rock, and groundwater samples, vapor measurements were collected from the soil borings and rock core during drilling operations using a photoionization detector (PID) (at all 7 boring locations). Vapor measurements were obtained of the soil and rock sampled and any cuttings that were brought to the surface during drilling operations. Radiological surveys were also performed during the boring activities. Drilling equipment was subjected to a radiological survey prior to its use at the Property and after drilling operations ceased. In addition, the soil samples collected for analysis and soil cuttings brought to the surface during drilling operations were surveyed for radioactivity. The PID and radiological survey equipment were standardized and calibrated as required by internal procedures. Vapors were detected at levels slightly above background levels in two borings. The PID measurement at the 6 to 9.5 foot interval BLSD in borehole JIBS-02 was recorded at 0.1 ppm and background for that boring was 0.0 ppm. Likewise at the 20 foot level BLSD in JIBS-07 (rock core hole), a PID measurement of 1.2 ppm

was recorded and background for that hole was 1.1 ppm. The detection of vapors at levels slightly above background levels is attributable to the presence of a gasoline container that was placed near the drill rig. The presence of the gasoline container also explains the increase in vapor background level (i.e., from 0 to greater than 1 ppm). No radiological contamination was detected on the samples and cuttings, or on the drilling equipment at the cessation of drilling operations.

Soil Sampling Results

As stated above, thirteen soil samples were collected and analyzed for VOCs, metals, and radiochemical parameters. This section presents a summary of the soil sampling results.

As shown in Table 2, with the exception of acetone, several VOCs were detected sporadically throughout the Property at extremely low levels (refer to Figure 1 for the sample locations listed in the table). Typically, the VOC detections occurred in only one of the two samples at a particular boring and, in most instances, the sample from the lower depth interval. In most instances the concentrations of these detected VOC were reported as estimated because they were below the reporting limit, meaning that although detected, the concentrations may not be quantifiable with acceptable precision. For the VOCs for which background data were available (i.e., 2-Butanone, acetone, methylene chloride, and toluene), all but the acetone values were at or below the background values.

The highest VOC detections reported were for acetone. Acetone was detected in 10 out of the 13 soil samples. However, upon further investigation, it was determined that the sampling technicians used isopropanol (70%) wipes to decontaminate the sampling equipment and did not allow the equipment to completely air dry in all cases after decontamination prior to collection of the following sample. Paragon Analytics confirmed that the quantitation of either or both isopropanol and acetone may have been compromised. Identification and quantitation of acetone is difficult when large amounts of isopropanol are present and likely resulted in the reported acetone concentrations being biased high. This is further substantiated by the fact that the soil samples collected the first part of each day of drilling, when the sampling equipment was most likely to have thoroughly dried from the prior decontamination, had low (i.e., less than background values) or undetected acetone concentrations.

Methylene chloride was identified in the trip blank at levels similar to the reported sample results and was also identified in the laboratory method blank suggesting likely field and laboratory contamination by this constituent.

For the other sporadically-detected VOCs for which background data were not available (i.e., benzene, ethylbenzene, xylenes, naphthalene, 1,2,4-Trimethylbenzene, and 1,3,5-Trimethlybenzene), their presence could indicate the potential presence of minor historical fuel leaks or possible residuals from application of oil as a dust suppressant in the parking area prior to when it was paved. However, the detections are extremely low and well below the EPA Region IX Preliminary Remediation Goals (PRGs) that are often used as soil screening levels at remediation sites. As a result, none of these VOCs are believed to indicate the presence of hazardous substance contamination at the Property which would preclude transfer of the Property. In addition, the JIBS facility has features that will mitigate VOCs,

including the building's slightly positive pressure, use of large volumes of outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants.

TABLE 2

VOC Results Summary for Soil Samples

Parameter	Number of Detections	Locations of Detections[d]	Minimum Detected	Maximum Detected	Background Range[a]	Units	EPA Region IX PRGs[b]
2-Butanone	1/13	JIBS01.S08	6.7 J	6.7 J	67 J - 260 J	µg/kg	22000000
Acetone	10/13	All but JIBS04.S07, JIBS06.S08, JIBS07.S06	9 J	210	4 J - 29 J	µg/kg	800
Benzene	2/13	JIBS01.S08, JIBS06.S06	1.4 J	1.5 J	NA	µg/kg	2
Ethylbenzene	5/13	JIBS01.S08. JIBS03.S06, JIBS03.S08, JIBS05.S08, JIBS06.S06	1.2 J	5 J	NA	µg/kg	700
M+P-Xylenes	2/13	JIBS01.S08, JIBS03.S08	4.9 J	7.4	NA	µg/kg	10000[e]
Methylene Chloride[c]	12/13	All but JIBS07.S06	1.7 J, B	2.2 J, B	17 J - 30 J	µg/kg	1
Naphthalene	2/13	JIBS06.S06, JIBS06.S08	6.2 J	8.6	NA	µg/kg	4000
O-Xylene	4/13	JIBS01.S08, JIBS03.S08, JIBS05.S08, JIBS06.S06	1.2 J	4.2 J	NA	µg/kg	10000[e]
Toluene	4/13	JIBS01.S08, JIBS03.S08, JIBS05.S08, JIBS06.S06	1.4 J	4.2 J	2 J - 4 J	µg/kg	600
1,2,4-Trimethylbenzene	3/13	JIBS01.S08, JIBS03.S08, JIBS06.S06	2 J	5	NA	µg/kg	52000
1,3,5-Trimethylbenzene	1/13	JIBS06.S06	2 J	2 J	NA	µg/kg	21000

J represents an estimated value between the reporting limit and the method detection limit.
B indicates that the compound was reported in the laboratory method blank (i.e., a potential laboratory contaminant).
NA = not available

[a] Source (unless otherwise noted): *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 3, Appendix A: WAG 1 Soil Sampling and Analysis Program*, DOE/OR-1043/V3&D1, September 1992
[b] EPA Region 9 Preliminary Remediation Goals (PRGs), U.S. EPA, October 2004 (values listed are the most conservative values for all pathways for which data are provided)
[c] Methylene chloride was reported at similar levels in the trip blank.
[d] Location is JIBSXX.SYY where XX stands for the boring number and YY for the bottom depth of the sample.
[e] Value is for total xylenes.

Table 3 presents a summary of the metals results for the soil samples. As shown the table, several metals were detected at low levels in all or nearly all of the samples. With the exception of one lead result at 110 mg/kg, all other metals results were at or below background values. Although the background range for lead in soil is listed as 10 to 70 mg/kg, it is not uncommon for soils in urban areas, particularly along city streets, to have greater than 200 mg/kg lead. This single detection of lead in the soil above background levels is not believed to indicate the presence of hazardous substance contamination at the Property which would preclude transfer of the Property.

TABLE 3

Metals Results Summary for Soil Samples

Parameter	Number of Detections	Minimum Detected	Maximum Detected	Background Range[a]	Units
Arsenic	13/13	1.1	21	1.7 - 27.0[b]	mg/kg
Barium	13/13	27	130	38.5 - 403	mg/kg
Chromium	13/13	12	68	20 - 100[b]	mg/kg
Lead	13/13	9.8	**110**	10 - 70[b]	mg/kg
Mercury	13/13	0.0096 B	0.15	0.12 - 0.15	mg/kg
Selenium	2/13	1 B	1.1 B	10 - 70[b]	mg/kg
Silver	9/13	0.12 B	0.44 B	2.1 - 4.4	mg/kg

B represents an estimated value between the reporting limit and the instrument detection limit.

[a] Source (unless otherwise noted): *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 3, Appendix A: WAG 1 Soil Sampling and Analysis Program*, DOE/OR-1043/V3&D1, September 1992

[b] Generic soil background values for clay and clay-loamy soils from: Kabata-Pendias, Alina, Henryk Pendias, "Trace Elements in Soils and Plants," 1985, CRC Press, Inc.

Table 4 provides a summary of the radiochemical results for the soil samples. Gross alpha and gross beta were detected in all samples, but at levels below background values. Several radionuclides were also detected but all are naturally occurring radionuclides and were detected at very low levels. The soil radiochemical results do not indicate the presence of any hazardous substances that would preclude transfer of the Property.

TABLE 4

Radiochemical Results Summary for Soil Samples

Parameter	Number of Detections	Minimum Detected	Maximum Detected	Background Range[a]	Units
Gross Alpha	13/13	2.36 LT	6.24	12.0 - 56.0	pCi/g
Gross Beta	13/13	2.69 LT	5.41	6.0 - 34.0	pCi/g
Ac-228	8/13	1.13 G	2.34 G	b	pCi/g
Bi-214	13/13	0.54 G,J	0.997 G,J	b	pCi/g
K-40	13/13	8.95 G	25.2 G	b	pCi/g
Pb-212	13/13	0.858 G	1.55 G	b	pCi/g
Pb-214	13/13	0.532 G, J	1.21 G, J	b	pCi/g
Th-234	1/13	2.33 G, TI	2.33 G, TI	b	pCi/g
TI-208	11/13	0.311 G, TI	0.553 G	b	pCi/g

G means the sample density differs by more than 15% of the Laboratory Control Sample density.
TI means that the radionuclide identification was tentative.
J represents an estimated value between the Minimum Detectable Concentration (MDC) and results +/- 2s TPU.
LT means the result is less than the requested MDC, but is greater than the sample-specific MDC.

[a] Source (unless otherwise noted): *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 3, Appendix A: WAG 1 Soil Sampling and Analysis Program*, DOE/OR-1043/V3&D1, September 1992.
[b] These radionuclides are naturally occurring and originate from primordial sources, such as K-40 and either the thorium decay series or uranium (U-238) decay series.

Rock Sampling Results

As stated previously, three rock samples were collected from the rock core boring at depths of 10, 20, and 40 ft BLSD and analyzed for metals and radiochemical parameters. Because rock core cannot reliably be analyzed for VOCs, groundwater collected from the temporary piezometer was analyzed for VOCs in lieu of the rock core samples (see following section for groundwater sampling results). Five metals were detected in each of the rock samples, but at very low levels, much lower than the levels detected in the overlying soils, as shown in Table 5. Gross alpha and gross beta were detected in one sample and at levels lower than the overlying soils (see Table 5). Three radionuclides were detected in one or two samples each (see Table 5), but all are naturally occurring radionuclides and were detected at very low levels. The detected metals and radiochemical results in the rock samples indicate that hazardous substances are not present in the deeper subsurface beneath the Property.

TABLE 5

Results Summary for Rock Samples

Parameter	Number of Detections	Minimum Detected	Maximum Detected	Units
Arsenic	3/3	0.29 B	2.2	mg/kg
Barium	3/3	11	17	mg/kg
Cadmium	3/3	0.069 B	0.13 B	mg/kg
Chromium	3/3	4.2	11	mg/kg
Lead	3/3	2.6 B	5.6	mg/kg
Gross Alpha	1/3	1.75 LT	1.75 LT	pCi/g
Gross Beta	1/3	3.26 LT	3.26 LT	pCi/g
K-40[a]	2/3	5.81	7.56 G	pCi/g
Pb-212[a]	1/3	0.314 G	0.314 G	pCi/g
Tl-208[a]	1/3	0.197 G	0.197 G	pCi/g

B represents an estimated value between the reporting limit and the instrument detection limit.
G means the sample density differs by more than 15% of the Laboratory Control Sample density.
LT means the result is less than the requested MDC, but is greater than the sample-specific MDC.

[a] These radionuclides are naturally occurring and originate from primordial sources, such as K-40 and either the thorium decay series or uranium (U-238) decay series.

Groundwater Sampling Results

As previously discussed, a temporary piezometer was installed in the rock core boring at the location of the proposed elevator piston, the only part of the JIBS facility that will extend below 3 m (10 ft). After development in accordance with the SAP and general industry standards, a groundwater grab sample was collected from the piezometer on March 31, 2005 and analyzed for VOCs, metals, and radiochemical parameters.

The only VOC detected in the groundwater sample was chloroform (2.4 µg/L). However, chloroform was detected 2.5 times higher in the trip blank (6.1 µg/L) indicating the presence of contamination resulting from the sample container or preservative during transport and storage.

Five metals (i.e., arsenic, barium, cadmium, chromium, and lead) were detected in the groundwater sample at extremely low levels as shown in Table 6. With the exception of arsenic, all results were below the maximum background values from reference groundwater wells located near the main campus of the Oak Ridge National Laboratory (Wells 1250, 1251, 1252, 4001, and 4002).[56] Although the concentration of arsenic in the groundwater sample is slightly higher than the background value, the concentration is

[56] *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-1043/V4&D1.

lower than the National Primary Drinking Water Standard (see Table 6). Arsenic is a naturally occurring metal in carbonate geological formations in the Valley and Ridge Physiographic Province.

Table 6
Contaminant Concentrations in Groundwater Collected from JIBS-07/Temporary Piezometer

			Background Values[a]			Reference Standards			
Parameter	Result	Units	Min.	Max.	Mean	NPDWS	TNDWSS	4% DOE DCG	Units
Arsenic	5.2 B	µg/L	2.6	2.6	2.6	10	5		µg/L
Barium	110	µg/L	50.3	148	93.8	2000	2000	-	µg/L
Cadmium	1.7 B	µg/L	4.6	5.2	4.9	5	5	-	µg/L
Chromium	1.8 B	µg/L	16	25.7	19.9	100	100	-	µg/L
Lead	2.6 B	µg/L	25.7	25.7	25.7	15	5	-	µg/L
Bi-214	30 J	pCi/L	-	-	-	-	-	24000	pCi/L
Pb-214	31.4 J	pCi/L	-	-	-	-	-	8000	pCi/L
Gross beta	2.9 LT	pCi/L	3.8	4.9	4.2	50	-	-	pCi/L

J = estimated result
LT = result is less than the requested minimum detectable concentration (MDC) and greater than the sample specific MDC
B = result is between the instrument detection limit and the reporting limit
NPDWS = National Primary Drinking Water Standards
TNDWS = Tennessee Domestic Water Supply Standards
U. S. Department of Energy (DOE) Derived Concentration Guidelines (DCG) from DOE Order 5400.5, Radiation Protection of the Public and the Environment, February 8, 1990

[a] Background values from reference groundwater wells located near the main campus of ORNL (Wells 1250, 1251, 1252, 4001, and 4002) reported in the *Site Characterization Summary Report for Waste Area Grouping 1 at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-1043/V4&D1.

Gross beta was detected in the groundwater sample at 2.9 pCi/L, which is below the background level. Low levels of two naturally-occurring radionuclides (Bi-214 and Pb-214) were also detected as shown in Table 6.

As stated in the Covenant Deferral Request, there will be no contact with groundwater at the Property after construction of the elevator piston shaft is completed. In addition, groundwater throughout Bethel Valley will be characterized as part of the Bethel Valley Groundwater Remedial Investigation/Feasibility Study scheduled for completion in 2012, which will be followed by the Bethel Valley Groundwater Record of Decision (ROD) in 2013. Any remedial actions required on the Property by that or any other ROD will be implemented by DOE.

Based on the above, the results of the groundwater sample collected from the proposed location of the JIBS elevator piston do not indicate the presence of any hazardous substances that would preclude transfer of the Property.

Conclusions

Results of the soil, rock, and groundwater sampling at the proposed JIBS site in March 2005 do not indicate the presence of any hazardous substance contamination that would preclude transfer of the Property. These sampling results indicate sporadic, low-level detections (in the part per billion range) of several VOCs in soil, a low level detection of arsenic (which is a naturally occurring metal in east Tennessee carbonate bedrock) slightly above the one available Oak Ridge National Laboratory groundwater background measurement, low level detections of gross alpha and gross beta below background levels in all media, and low level detections of several naturally-occurring radionuclides in all media at the Property. These results are consistent with the results of the radiological survey conducted at the Property in September 2004, and the results of the radiological surveys and PID measurements obtained during the geotechnical investigation conducted in November 2004. No contamination was detected above background levels during these previous surveys/investigations. These environmental screening results also confirm the conclusion from the document reviews, interviews, review of historical sampling data, and physical/visual inspections that hazardous substances have not been used, stored, or disposed on the Property. Based on the sampling results, document/data reviews, interviews, and inspections, transfer of the Property and the excavation needed to construct the JIBS would be protective of human health and the environment. In addition, the JIBS facility has features that will mitigate VOCs, including the building's slightly positive pressure, use of large volumes of outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants.

ATTACHMENT A

LIST OF ANALYTES

Volatiles	1,1,1,2-TETRACHLOROETHANE
	1,1,1-TRICHLOROETHANE
	1,1,2,2-TETRACHLOROETHANE
	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE
	1,1,2-TRICHLOROETHANE
	1,1-DICHLOROETHANE
	1,1-DICHLOROETHENE
	1,1-DICHLOROPROPENE
	1,2,3-TRICHLOROBENZENE
	1,2,3-TRICHLOROPROPANE
	1,2,4-TRICHLOROBENZENE
	1,2,4-TRIMETHYLBENZENE
	1,2-DIBROMO-3-CHLOROPROPANE
	1,2-DIBROMOETHANE
	1,2-DICHLOROBENZENE
	1,2-DICHLOROETHANE
	1,2-DICHLOROPROPANE
	1,3,5-TRIMETHYLBENZENE
	1,3-DICHLOROBENZENE
	1,3-DICHLOROPROPANE
	1,4-DICHLOROBENZENE
	1-CHLOROHEXANE
	2,2-DICHLOROPROPANE
	2-BUTANONE
	2-CHLOROTOLUENE
	2-HEXANONE
	4-CHLOROTOLUENE
	4-METHYL-2-PENTANONE
	ACETONE
	BENZENE
	BROMOBENZENE
	BROMOCHLOROMETHANE
	BROMODICHLOROMETHANE
	BROMOFORM
	BROMOMETHANE
	CARBON DISULFIDE
	CARBON TETRACHLORIDE
	CHLOROBENZENE
	CHLOROETHANE
	CHLOROFORM
	CHLOROMETHANE
	CIS-1,2-DICHLOROETHENE
	CIS-1,3-DICHLOROPROPENE
	DIBROMOCHLOROMETHANE
	DIBROMOMETHANE
	DICHLORODIFLUOROMETHANE
	ETHYLBENZENE

	HEXACHLOROBUTADIENE
	IODOMETHANE
	ISOPROPYLBENZENE
	M+P-XYLENE
	METHYL TERTIARY BUTYL ETHER
	METHYLENE CHLORIDE
	NAPHTHALENE
	N-BUTYLBENZENE
	N-PROPYLBENZENE
	O-XYLENE
	P-ISOPROPYLTOLUENE
	SEC-BUTYLBENZENE
	STYRENE
	TERT-BUTYLBENZENE
	TETRACHLOROETHENE
	TOLUENE
	TRANS-1,2-DICHLOROETHENE
	TRANS-1,3-DICHLOROPROPENE
	TRICHLOROETHENE
	TRICHLOROFLUOROMETHANE
	VINYL ACETATE
	VINYL CHLORIDE
Metals	ARSENIC
	BARIUM
	CADMIUM
	CHROMIUM
	LEAD
	SELENIUM
	SILVER
	MERCURY
Radiochemical	GROSS ALPHA
	GROSS BETA
	Ac-228
	Ag-110m
	Al-26
	Am-241
	Be-7
	Bi-212
	Bi-214
	Ce-139
	Ce-144
	Co-56
	Co-57
	Co-58
	Co-60
	Cr-51
	Cs-134
	Cs-137
	Eu-152
	Eu-154

Eu-155
Fe-59
I-131
K-40
Mn-54
Na-22
Nb-94
Nb-95
Pa-234m
Pb-212
Pb-214
Ru-106
Sb-124
Sb-125
Sc-46
Th-227
Th-234
Tl-208
U-235
Zn-65

Appendix G

Evaluation of Vapor Intrusion to Indoor Air Pathway for Proposed Joint Institute for Biological Sciences (JIBS)

An evaluation of the vapor intrusion to indoor air pathway was conducted in support of the Covenant Deferral Request (CDR) for transfer of a 1 acre site for the proposed Joint Institute for Biological Sciences (JIBS) from the U.S. Department of Energy (DOE) to the State of Tennessee. This document describes the evaluation performed and the conclusions reached.

1.0 Background

In November 2002, the U.S. Environmental Protection Agency (EPA) issued Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). The draft guidance is intended to assist in evaluating whether the vapor intrusion exposure pathway is complete and, if so, whether it poses an unacceptable risk to human health. The draft guidance is recommended for Resource Conservation and Recovery Act (RCRA) Corrective Action; Comprehensive Environmental Response Compensation, and Liabilities Act (CERCLA) National Priorities List and Superfund Alternative Sites; and Brownfields sites. The draft guidance was intended primarily for protection of the public under residential land use but may be adjusted for other land uses.

As defined in the draft guidance, "vapor intrusion is the migration of volatile chemicals from the subsurface into overlying buildings."[1] Volatile chemicals in contaminated subsurface soils and/or groundwater can emit vapors that may migrate through the soils and into indoor air in overlying buildings. While vapors may be present in and migrate through the subsurface, the vapors may or may not pose a risk to human health.

Possible outcomes of the evaluation are:

- The exposure pathway from the source contamination to humans is not complete and, therefore, there is no risk to human health;
- The exposure pathway from the source contamination to humans may be complete but the vapors may be present at such low levels that the risk to human health is considered negligible; or
- The exposure pathway from the source contamination to humans may be complete and vapors may accumulate in the building to levels that may pose an unacceptable risk to human health.

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[1] EPA. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, November 29, 2002.

2.0 Tiered Approach for Evaluation

A three-tiered approach involving increasing levels of complexity and specificity is recommended for the evaluation:

- **Tier 1** – Primary screening based on general knowledge of a site and chemicals known or reasonably expected to be present in the subsurface (chemical concentration data is not required)
- **Tier 2** – Secondary screening based on limited site-specific information about the contamination source and subsurface conditions (measured or estimated concentration data and depth of contamination and soil type needed)
- **Tier 3** – Site-Specific Pathway Assessment based on detailed site-specific information and confirmatory sub-slab and/or indoor air sampling

The guidance recommends starting with Tier 1 and proceeding to either Tier 2 or Tier 3. However, prior to proceeding with the screening, it is recommended that a conceptual site model be developed for the site, which includes the contaminant sources, movement of the contaminant sources in the environment, and the exposure pathways and potential receptors for the contaminant sources.

A conceptual model of the West Bethel Valley Area at the Oak Ridge National Laboratory (ORNL), which includes the proposed JIBS site, is documented in both the Remedial Investigation/Feasibility Study for Bethel Valley Watershed[2] and the Record of Decision for Interim Actions in Bethel Valley.[3] The conceptual model is not duplicated here. Instead, the reader is referred to either of these documents for a discussion of the model.

3.0 Tier 1—Primary Screening

The Tier 1 primary screening step is designed to screen out sites for which the vapor intrusion pathway does not require further consideration. If a potential exists at a site for vapor intrusion from the subsurface, this step then determines whether the current conditions warrant immediate action because of potential unacceptable indoor inhalation risks. Three questions are presented in the guidance to assist in making these determinations.

3.1 Question 1: Are Chemicals Of Sufficient Volatility And Toxicity Known Or Reasonably Suspected To Be Present In The Subsurface?

In the guidance, EPA provides a list of chemicals (in Table 1) that may be found at hazardous waste sites, and are sufficiently volatile to result in potentially significant vapor intrusion and are sufficiently toxic to result in potentially unacceptable indoor air inhalation risks. EPA used a value of Henry's Law Constant of greater than 10^{-5} atm m^3/mol as the level above which chemicals were considered to be "sufficiently volatile." For "sufficiently toxic," EPA used either an incremental lifetime cancer risk greater than 10^{-6} or a non-cancer hazard index greater than 1 or, in some cases, both. EPA recommends that any chemicals on the Table 1 list present at the site be identified as constituents of potential concern for the vapor intrusion pathway and be evaluated in subsequent questions. If the Table 1 chemicals and no other volatile chemicals are present at the site, EPA recommends that the vapor intrusion pathway be considered incomplete and that no further consideration of the pathway is needed.

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[2] Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

[3] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

In accordance with CERCLA Section 120(h), reviews of government records, title documents, and aerial and ground-level photographs; visual and physical inspections of the proposed JIBS site and adjacent properties; reviews of soil sampling data; and interviews with employees were conducted to identify any areas on the proposed JIBS site where hazardous substances and/or petroleum products were stored, released, or disposed. Additionally, radiological surveys were conducted during the March 2005 environmental screening, November 2004 geotechnical investigation, and September 2004 radiological surface survey of the Property to provide indication of the radiological condition of the JIBS site. Based on the record and document reviews, inspections, environmental sampling and radiological survey results, and interviews conducted, there is no hazardous substance contamination present in the upper 10 ft of soil at the Property, in the bedrock (to a depth of 40 ft BLSD) at the location of the proposed JIBS elevator piston, or in shallow groundwater beneath the Property that would preclude transfer of the Property.

Environmental monitoring information confirms that groundwater under portions of ORNL is contaminated due to historical activities. As discussed above, no VOCs were present in the March 2005 groundwater sample from the temporary piezometer installed at the location of the proposed JIBS elevator piston. However, several VOCs were sporadically detected at extremely low levels in the March 2005 soil samples from the Property and several VOCs were detected in groundwater at low, mostly estimated (i.e., detected but may not be quantifiable with acceptable precision), levels in nearby wells.[4] The soil VOC detections could indicate the potential presence of minor historical fuel leaks or possible residuals from application of oil as a dust suppressant in the parking area prior to when it was paved. However, the detections in the soil are extremely low and well below the EPA Region IX Preliminary Remediation Goals (PRGs) that are often used as soil screening levels at remediation sites and do not indicate the presence of hazardous substance contamination that would preclude transfer of the Property. In addition, the JIBS facility has features that will mitigate VOCs, including the building's slightly positive pressure, use of large volumes of outside air as make-up for the central laboratory exhaust system, and standard construction details, such as below-the-slab vapor barrier, water proofing, and joint sealants.

Two VOCs, 1,2-Dichloropropane (one detection at 0.006 mg/L in each of Wells 533 and 542) and tetrachloroethylene (one detection at 0.0276 mg/L in Well 542), were reported at levels exceeding MCLs. EPA's VI Guidance sets the trigger levels for 1,2-Dichloropropane and tetrachloroethylene at 0.035 mg/L and 0.011 mg/L, respectively, for an incremental individual lifetime cancer risk of 10^{-5}. Neither of these wells is located within 100 ft of the Property. Well 533 is located approximately 600 ft to the west and side-gradient of the property. Shallow groundwater flow from Well 533 is south toward the Northwest Tributary. Any potential contamination from this well is likely to flow toward the Northwest Tributary and into First Creek and not toward the Property. Well 542 is located approximately 560 ft east of the Property, across First Creek. Shallow groundwater flow from Well 542 is south toward White Oak Creek and should not affect the Property. Discussions with geologists familiar with the ORNL site have confirmed that there are no known preferential pathways between these wells and the Property.

In addition to the VOC detections above MCLs, several other VOCs, primarily toluene, were detected at low levels in the vicinity of the property, primarily in wells east of First Creek. Toluene was detected in wells on both sides of First Creek (i.e., Wells 533, 535, and 4008) at levels ranging from 0.001J to 0.004J mg/L. Other VOCs, such as carbon disulfide, 2-Butanone, benzene, 1,2-Dichloroethene, methylene chloride, were detected only in wells east of First Creek (i.e., Wells 541,

[4] Bechtel Jacobs Company LLC. *Record of Decision for Interim Actions in Bethel Valley, Oak Ridge, Tennessee*, DOE/OR/01-1862&D4, May 2002.

542, and 811) and at levels ranging from 0.0005J to 0.008 mg/L.

However, the shallow groundwater gradient in the West Bethel Valley Area is from the northwest to the south/southeast toward the Northwest Tributary and First Creek so contaminants in these wells west of First Creek would not be expected to flow toward the Property.[5] Since First Creek effectively acts as a shallow groundwater divide, contaminants in wells east of First Creek are not expected to affect the Property.

3.2 Question 2: Are Currently (Or Potentially) Inhabited Buildings Or Areas Of Concern Under Future Development Scenarios Located Near Subsurface Contaminants Found In Table 1?

This question focuses on determining whether inhabited buildings are currently located, or as part of future development, may reasonably be expected to be located, above or near subsurface contamination that presents an unacceptable indoor air inhalation risk. "Inhabited" buildings, as defined by EPA, are structures with an enclosed air space designed for human occupancy. In the guidance, EPA generally considers "near" to mean located within approximately 100 feet laterally or vertically of known or interpolated soil gas or groundwater contaminants listed in Table 1. In addition, the contamination must occur in the unsaturated zone and/or uppermost saturated zone.

For evaluating the potential for future risks, EPA recommends consideration be given to migration of any contaminant plumes in groundwater and whether any significant preferential pathways are present that could allow vapors to migrate more than 100 feet laterally. A significant preferential pathway is defined, for purposes of the guidance, as "a naturally occurring or anthropogenic subsurface pathway that is expected to have a high gas permeability and be of sufficient volume and proximity to a building so that it may be reasonably anticipated to influence vapor intrusion into the building" (e.g., fractures, macropores, utility conduits, and subsurface drains that intersect vapor sources or vapor migration pathways).

There are no currently inhabited buildings on the proposed JIBS site. However, the proposed JIBS will likely be constructed on the site in the near future.

The nearest known potential subsurface contaminants to the proposed JIBS are in disposal areas located more than 0.5 mi to the west of the proposed site. In addition, the low level VOC detections are primarily in wells located more than 300 ft from the Property. In wells within 100 ft of the Property (i.e., Well 536), only an isolated, low-level detection of 2-Hexanone was reported in October 1990. 2-Hexanone was not detected in subsequent sampling events at this well.

Based on the above, the future JIBS will not be located "near" (i.e., will be located more than 100 feet from) any known potential contamination. Therefore, there is no potential for the vapor intrusion pathway to impact either currently inhabited buildings or future buildings and no further evaluation of this pathway is required.

3.3 Question 3: Does Evidence Suggest Immediate Action May Be Warranted To Mitigate Current Risks?

This question focuses on determining whether any immediate action is necessary to verify or abate imminent and substantial threats to human health for buildings identified in Question 2. Criteria that are generally considered sufficient to warrant immediate action include presence of odors, physiological effects reported by occupants, wet basements in areas where chemicals of sufficient

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[5] Jacobs EM Team. *Remedial Investigation/Feasibility Study for Bethel Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-01-1748/V1&D2, Volume 1, Bechtel Jacobs Company LLC, May 1999.

volatility and toxicity are known to be present in groundwater and the basements are prone to groundwater intrusion or flooding, and known short-term safety concerns.

This question is not applicable to the proposed JIBS site because no buildings were identified in Question 2.

4.0 Conclusions

Based on the Tier 1—Primary Screening, the conclusions of the evaluation are:

- The subsurface vapor to indoor air pathway is incomplete at the proposed JIBS site due to the fact that: 1) the only VOCs detected at greater than background levels by PID during investigations at the Property in 2004 and 2005 were two isolated detections 0.001 ppm above background levels attributable to a gasoline container placed next to the drill rig, 2) although several VOCs were detected sporadically at low levels (in the parts per billion range) in the soil samples, no VOCs were detected in the groundwater sample collected at the Property in March 2005, 3) VOCs have been detected in groundwater on adjacent property in a limited number of instances, 4) although one VOC detection in groundwater on adjacent property exceeded the trigger level in the EPA VI Guidance (tetrachloroethylene in Well 542), the well is located across First Creek, a shallow groundwater divide, from the Property, 5) the distance between the most of the groundwater wells and the Property is greater than 100 feet (Well 536 is the only well less than 100 feet from the Property), and 6) the absence of known preferential pathways between the groundwater wells and the Property.
- As a result, no further consideration of the vapor intrusion to indoor air pathway is required for the proposed JIBS site.